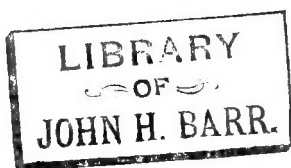




TA410  
U58



*Compliments of*

GEN. D. W. FLAGLER

*Chief of Ordnance, U. S. Army.*

JOHN H. BARR.

Cornell University Library

TA 410.U58

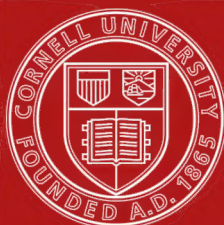
v.2

Report of the tests of metals and other



3 1924 004 632 976

engr



## Cornell University Library

The original of this book is in  
the Cornell University Library.

There are no known copyright restrictions in  
the United States on the use of the text.



JOHN W. DARR.



REPORT  
OF THE  
TESTS OF METALS  
AND  
OTHER MATERIALS  
FOR  
INDUSTRIAL PURPOSES  
MADE WITH THE  
UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL,  
MASSACHUSETTS,  
DURING  
THE FISCAL YEAR ENDED JUNE 30, 1890.



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1891.





L E T T E R  
FROM  
THE SECRETARY OF WAR,

TRANSMITTING,

*With a letter from the Chief of Ordnance, a report of the colonel commanding the Watertown Arsenal of the tests of iron and steel, etc., made with the United States testing machine during the fiscal year ended June 30, 1890.*

---

JANUARY 9, 1891.—Referred to the Committee on Expenditures in the War Department.

---

WAR DEPARTMENT,  
Washington, D. C., January 8, 1891.

SIR: I have the honor to transmit to Congress, in compliance with the provisions of the sundry civil act of March 3, 1885 (23 Stats., p. 502), a letter from the Chief of Ordnance, U. S. Army, dated the 6th instant, and its accompanying report of Col. D. W. Flagler, Ordnance Department, U. S. Army, commanding the Watertown Arsenal, dated December 31, 1890, of "tests of iron, steel, and other materials for industrial purposes," made with the United States testing machine during the fiscal year ended June 30, 1890.

Very respectfully,

REDFIELD PROCTOR,  
*Secretary of War.*

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

---

ORDNANCE OFFICE, WAR DEPARTMENT,  
Washington, D. C., January 6, 1891.

SIR: I have the honor to submit for transmission to Congress, as required by law, the report of Col. D. W. Flagler, Ordnance Department, commanding Watertown Arsenal, of "tests of iron, steel, and other materials for industrial purposes," made with the United States testing machine during the fiscal year ended June 30, 1890.

Very respectfully,

S. V. BENÉT,  
*Brigadier-General, Chief of Ordnance.*

The SECRETARY OF WAR.

WATERTOWN ARSENAL,  
Watertown, Mass., December 31, 1890.

SIR: I have the honor to submit the following report of tests of materials for industrial and other purposes made at this arsenal during the fiscal year ending June 30, 1890, in compliance with the requirements of the act of Congress appropriating funds for the testing machine.

The total number of specimens tested during the year is 5,655. The receipts and expenditures were as follows:

Amount appropriated for testing machine and testing work .....	\$10,000.00
Received during the year for private tests .....	1,250.24
<b>Total received .....</b>	<b>11,250.24</b>
<b>Amount expended for services and labor .....</b>	<b>8,420.39</b>
Amount expended for light, power, tools, implements, and material for test .....	2,829.85
<b>Total expended .....</b>	<b>11,250.24</b>

The tests made are comprised under three classes, viz:

- (A) Tests made for the various Departments of the Government.
- (B) Tests made for private parties.
- (C) Investigating tests.

A portion of the tests in Class A are tests of metals used in gun construction. Of these, 1,244 specimens have been tested during the year. The others under this class are tests made for the various arsenals and for other Departments of the Government, amounting in all to 3,420 specimens, making the total number of specimens tested under Class A during the year 4,664.

The tests made under Class B are paid for by the parties who have the tests made, and the results obtained, being confidential, are not given in the report. The total number of specimens tested in this class during the year is 991.

Class C comprises a large variety of investigating tests and work which occupies the time of the testing machine when not occupied with work comprised under Classes A and B. The object of these tests is the development of knowledge, useful to the public, in regard to the physical properties, strength, and endurance of materials used for structural purposes. The principal work and subjects of investigation pursued during the year are as follows: Tests upon the effects of alternate stresses in iron and steel; the internal strains in steel forgings; tests of railway axles and steel rails which have undergone long-continued service; the endurance of metals subjected to repeated transverse stresses in rotating shafts; an inquiry into the physical properties of natural and artificial building stones, including effects of alternate heat and cold, moisture and its absence, on their strength and endurance; and numerous special and isolated tests for developing data and knowledge in special directions, not forming an immediate part of current investigation, but giving completeness to general metallurgical knowledge and supplying valuable information to meet the exigencies of immediate demands.

Although the tests under Classes A and B were made to determine the quality of materials and whether they fulfilled specifications, many of them have furnished knowledge useful for the investigations under Class C, and some of the reports under Class A are included in the reports of these investigations.

Some of the most interesting and important of the investigations carried on during the year under Class C are the following :

#### ENDURANCE TESTS OF ROTATING SHAFTS.

The general purpose of this series of tests has been to determine the relative and absolute endurance of different grades of steel and of wrought and cast iron when subjected to repeated alternate stresses applied transversely, the stresses themselves varying in magnitude from the elastic limit of the metal upward to near its ultimate strength.

The circumstances and stresses of these endurance tests are made analogous to those the metal is to undergo in actual service. The tests are tedious and expensive. An examination of the metal under other kinds of stresses, cheaply applied, such as tensile, compression, and transverse stresses, develops certain characteristic features in each case. One object in view has been to determine the relative importance and effect of these several features on the endurance tests, in order that we may, through a determination of the qualities of a metal by these cheap simple tests, predict what would be the conduct and endurance of the same in an actual service analogous to its service in the endurance test.

The significance of ordinary tests is little known. The fact that a metal possesses a certain elastic limit, tensile strength, elongation and contraction of area when ruptured by once loading, fails to convey an adequate idea of what the same metal will do under circumstances of repeated stresses, or when these repeated stresses are applied in alternate directions.

The present investigation pertains to the effects of alternate stresses in opposite directions in which the tensile and compressive stresses are of equal magnitude or nearly so, the difference being due to a slightly greater yielding in one direction, and a probable change in the position of the neutral axis in consequence of a difference in ductility on the two sides of the specimen.

The observations made include all the phenomena which accompany the test from its commencement up to the time of rupture, in order that it may be known what phases the metal passes through in the progress of rupture. In fact, such information is essential to a recognition of what influences are deteriorating and of the time when the metal reaches a critical state bordering on dissolution. These experiments are thought to be the first inaugurated which include a systematic observance of the phenomena preceding rupture, or at least the first carried out to any considerable extent.

No one series of tests, however, gives completeness to the metallurgical points raised during an investigation. Hence in the endurance tests many of the accompanying data are better understood by reference to the results obtained in the series of temperature tests, the effects of overstraining by tension, the effects of alternate tensile and compressive stresses, and tests on internal strains. Each of these classes contribute toward the complete elucidation of phenomena observed during an endurance test. The endurance tests comprise tests made at different speeds of rotation, from shafts slowly rotated by the hand up to a speed of 2,200 rotations per minute. Therefore at the highest rate of speed the stresses alternate from tension to compression in an interval of a little less than one thirty-sixth of a second, or in passing from a neutral state of stress to the maximum tensile or compressive stress the time occupied is about one seventy-third of a second. Higher speeds of rotation will be experimented with.

It will be seen that certain effects of rapidly applied stresses and stresses approaching vibratory movements are conveniently investigated in this class of experiments.

It may be observed that the molecular movements, as indicated by the transverse deflection of the shafts, is not interfered with by the highest speed of rotation which has yet been employed if the stresses are below the elastic limit of the metal.

If, however, the elastic limit is exceeded, the transverse deflection is less at high speeds than at low speeds. There is not time enough for performing the work against molecular friction and for completing the bending movement. In this case there is a rapid elevation in temperature unless means are employed to prevent it, such as running a stream of cold water on the shaft.

Comparative tests of both iron and steel shafts have been made at ordinary atmospheric temperature, and the same at the temperature of a blue heat or in the vicinity of 500° to 700° F.

Attention is invited to the remarkable endurance of a cast-iron bar which has made 37,151,900 revolutions while under the maximum fiber stress of 15,000 pounds per square inch. The bar is still unbroken.

A portion of the shafts have been annealed at intervals. Others have been run at higher temperatures for a time and the test then completed cold. Some bars have been initially heated by means of gas burners and the tests commenced hot and so continued. Others have been allowed to acquire a higher temperature from the molecular friction caused by excessive loads and a high rate of speed, no external heat being supplied in this case.

It is proposed to extend the tests by embracing a wider range of material in which the physical properties of the metals vary, from differences in chemical composition, and from differences in manipulation in the process of manufacture, comprising both hot worked and cold rolled, swaged, or drawn material. It is proposed also to continue the investigation at different temperatures; to ascertain the effect of overstraining with high loads on the subsequent endurance under moderate stresses to ascertain whether time is a function of the ultimate endurance, *i. e.*, whether varying the speed of rotation, other conditions of stresses; and temperature remaining unchanged, affects the results. It is also proposed, for observations upon the elastic properties, to increase the speed to the highest attainable.

#### ALTERNATE STRAINING OF STEEL, WROUGHT IRON, AND CAST IRON BARS.

This series of tests has been undertaken chiefly for the investigation of the elastic properties of steel and iron; the disturbance of elastic limits by overstraining; the temporary changes in the modulus of elasticity; the observance of bars which have rested a long time after they have been overstrained by tensile stresses or compressing stresses, and the restorative effects of annealing at different temperatures and by exposure to the annealing temperature through varying periods of time. Incidental to the above observations have also been made upon the ratio of lateral contraction to longitudinal extension and of lateral expansion to longitudinal compression.

These tests have been inaugurated and valuable data have been developed, yet much of the work contemplated on this series remains to be done.

In conjunction with the alternate straining by tension and compression stresses, there are in progress similar tests by transverse stresses, not included in the rotating tests.



## THE INTERNAL STRAINS IN SOME GUN FORGINGS HAVE BEEN INVESTIGATED.

This is an important line of investigation. Its object is to ascertain whether the preceding manipulation of the metal has left it in a state of comparative repose (that is, free from "initial strains"), or whether it is under strains or possesses within itself elements which may contribute to its destruction; or in cases where these internal strains have been introduced intentionally, to determine whether and to what extent they assist the normal strength of the metal in enduring the stresses incident to service.

The effect of various kinds of treatment may be understood by an examination of the state of strain left, and further, it is believed that by means of this kind of investigation much important information touching upon questions of chemical composition may be solved.

Previous investigations have connected the presence of internal strains with changes in density. If there were no changes in density it would be difficult to explain the presence of internal strains. It is obviously of interest to ascertain whether radical differences in chemical composition are accompanied by concomitant changes in the ability to receive internal strains.

Much prominence has been given to this and to kindred classes of tests, because it has seemed that many fundamental features were manifested by the metal in this direction, and that a critical examination would enable deteriorating conditions or treatment to be recognized thereby.

The testing of metals to determine the possession of specified physical properties is essential in order that a certain quality or grade of metal may be obtained to meet the requirements of important work, but such tests for quality leave many important questions untouched. The class of tests under consideration are capable of supplying some of the additional information required, and it is thought they justify the prominence that has been and continues to be given to this branch of the subject of the strength of materials.

## TESTS OF RAILWAY MATERIALS.

The tests of railway material have been continued and comprise the tests of axles, rails, and brake beams in the present report. The importance to the public of safety in all railway material and the severe stresses to which this class of material is ordinarily exposed make this subject one of importance.

*Axles.*—Axles have been examined which have had long-continued service, the journals of which showed incipient cracks, indicating that rupture had begun and that further use must result in complete rupture. It is a remarkable fact that the tests of the metal of these journals near these cracks showed no loss of strength or ductility. No indications of a tendency to crystallize were discovered, and inasmuch as the metal has gone through all the phases of deterioration up to the limit of actual rupture without showing a crystalline tendency, it is thought this demonstrates and proves that this material is incapable of cold crystallization when exposed to the conditions of service.

The endurance tests of rotating shafts supplement in a measure the indications of these axle tests.

The endurance tests made at a blue heat have an important practical bearing upon the question of the condition of a railway axle which has been run in an overheated condition.

*Steel rails.*—Some preliminary tests have been made of an exhaustive

series of tests upon the strength of steel rails. The series will embrace the tests of a large number of different types of rails and of metal having a wide range of chemical composition. A number of old rails which have given excellent results against abrasion and wear in the track will be examined by different physical tests and chemical analyses. Transverse elasticity and strength are now undergoing examination, and more extended results on this subject will appear in the next annual report of tests.

Some important results are now being reached with rails examined after they have been repeatedly so overloaded as to cause bending in different directions—that is, first downward and then upward—which treatment, in conjunction with the test of corresponding steels at higher temperatures, affords an intimate knowledge of the effects of overloading the track, of how far efforts to correct bent rails in the track may be successful, and determine what is the final state of the metal after such efforts. Also, the tests directly demonstrate what state new rails may be expected to be in which have been straightened by the usual process of *gagging* at low temperatures. All the phenomena connected with overstraining rails is of exceeding interest and will be fully developed in the next report.

#### TESTS OF NATURAL AND ARTIFICIAL STONES.

Some artificial stones and the natural stones of geological classes generally in use for building purposes are being investigated. The results in this report comprise coefficients of expansion and moduli of elasticity under compression stresses. These are preliminary to an exhaustive physical and chemical investigation of this class of material which is now in progress. This includes an investigation of the elastic properties of stones under pressure; the observation of phenomena under the application of heat and frost, wetting and drying; chemical composition; and the effects of solvents and oxidizing elements and compounds. It is hoped that an exhaustive investigation of both well-known durable stones and of well-known bad stones which fail and decay in known ways may determine enough of the characteristics of good and bad stones to enable us to ascertain thereafter by simple economical tests whether stones are suitable for architectural and engineering structures (or at least aid us in so doing). At present the only practicable sure method is the tedious and expensive test of erecting structures and waiting several decades to observe the effects of time, atmospheric and weather influences, and involves the serious expense of having structures fail because stones that were believed to be good turn out to be bad, or the expense of declining to use good cheap stones because they could not be proven to be good.

The increasing tendency to erect high architectural structures in large cities and the increasing magnitude of engineering structures adds greatly to the importance of the investigation of the elastic properties of building stones and brick. This subject has received too little attention hitherto, and will be a prominent feature in the prosecution of this investigation.

During the current year the investigation of the strength and elasticity of hemp and manilla cordage, commenced some years ago, will be continued on ropes of larger sizes.

The temperature tests of iron and steel will also be resumed.

It is thought that the data already developed places this subject in advance of all previous experiments. The intimate relation existing between the solution of important metallurgical manufacturing ques-

tions and the indications of the hot tests of the metals gives a valuable significance to these results. When we consider the limited thermal range over which these experiments have heretofore extended, and the wide field still unexplored, it leads to the belief that great benefit should result from this branch of investigation. A change of physical properties accompanies and appears to correspond to changes of temperature, and it is believed that the physical effects of changes of chemical composition and mechanical treatment can be shown by these temperature tests at higher temperatures. At any rate, the results are strikingly suggestive of such application.

The tests and investigations are grouped under the subjects given in the preface.

#### TABLE OF CONTENTS.

Complaints have been made of the difficulty experienced in finding and pursuing the study of special subjects in previous printed reports. To overcome this, this report has been arranged to have a brief of subjects printed at the top margin of the pages.

The addition of a chemical laboratory to the testing department was deemed so important that a special estimate therefor was made on March 19, 1890, and Congress has given the necessary appropriation therefor.

A knowledge of the chemical composition of materials is needful in planning and carrying out the expensive physical investigations made on the testing machine. Also, when satisfactory conclusions are arrived at as to what structural materials are best or satisfactory, it is very important to couple with this knowledge a knowledge of the chemical composition of these materials, as this may thereafter enable the public to sometimes identify and select satisfactory materials by a simple and inexpensive chemical analysis. This is especially true of stones and mortars.

The employment of a chemist permits also the repair and use of the excellent photographic apparatus on hand and the valuable addition of photographs of specimens to future reports.

Special attention is invited to the loss to the public from the long delay in publishing these reports.

The last report published is that of 1887.

The delay withholds from the public for several years valuable and oftentimes much-needed information.

Both the lack and need of this knowledge leads sometimes to duplicate expensive and unnecessary investigation and tests by other parties. The reports of these being first published sometimes deprives the testing department here of rightful reputation.

The investigations here can not take their proper place and have their proper effect in furnishing knowledge on current topics in physical and engineering science and as aids to the investigations of others if the knowledge obtained is withheld from the public 3 or 4 years.

The delay leads to applications for information in regard to results which have been obtained. As this knowledge is part of an official report, it can not be furnished privately, and this sometimes causes dissatisfaction.

Very respectfully, your obedient servant,

D. W. FLAGLER,

*Colonel, Ordnance Department U. S. Army, Commanding.*

The CHIEF OF ORDNANCE U. S. ARMY,

*Washington, D. C.*





## TABLE OF CONTENTS.

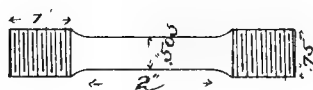
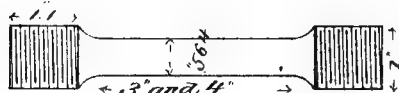
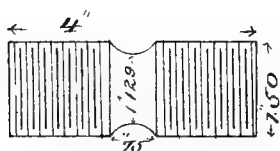
---

	Page.
1. 3.2-inch steel B. L. rifles .....	13-49
2. 3.6-inch steel B. L. rifles .....	50
3. 8-inch steel B. L. rifles .....	51-59
4. 10-inch wire-wound rifle .....	61-106
5. 12-inch B. L. rifle No. 1. ....	107-169
6. 12-inch B. L. rifled mortars .....	171-427
7. Square and flat steel wire .....	429-665
8. Aluminum and aluminum brass and bronze .....	667-678
9. Bronze from fractured tray hinge .....	679
10. Brass and steel ribbon tape .....	681-684
11. Alternate straining of steel, wrought-iron, and cast-iron bars .....	685-718
12. Specimens from stem of overstrained steel eye-bar .....	719-731
13. Initial strains in 8-inch tube and jacket and hoop $A_1$ for 12-inch steel B. L. rifle .....	733-736
14. Cast iron and pig irons .....	737-739
15. Compression of Belleville springs .....	741-747
16. Compression of rubber buffers .....	748-752
17. 12-inch mortar bodies, compression of quadrants .....	753-755
18. Railway axles .....	757-787
19. Steel rails .....	789-800
20. Brake beam .....	801
21. Miscellaneous steel specimens .....	802-857
22. Straining of cold-rolled staves for Woodbridge 10-inch rifle .....	858-860
23. Pyrotechnic mortar body .....	861
24. Chain cable .....	862
25. Endurance of rotating shafts .....	863-1095
26. Stones and building material .....	1097-1134
27. Shot-lines for U. S. Life-Saving Service .....	1135-1149
28. Cotton cloth .....	1150
29. Manilla rope .....	1151
30. Private tests .....	1152-1154

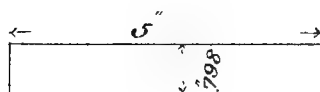


# Forms of gun specimens

## Tension



## Compression







---

## 3.2-INCH STEEL B. L. RIFLES.

---

SPECIMENS FROM TUBES AND GAS CHECKS.

---



No. 3866.

Marks, <sup>32 R</sup><sub>B T</sub> <sup>54 T</sup><sub>A M</sub>Diameter, <sup>17</sup><sub>1</sub>.505.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000400	.000400	0.	0.	
4,000	20,000	.000650	.000650	0.	0.	
6,000	30,000	.000950	.000950	0.	0.	
7,000	35,000	.001100	.000250	0.	0.	
8,000	40,000	.001250	.000150	0.	0.	
8,400	42,000	.001300	.000050	0.	0.	
8,600	43,000	.001350	.000050	0.	0.	
8,800	44,000	.001400	.000050	0.	0.	
9,000	45,000	.001450	.000050	0.	0.	
9,200	46,000	.001500	.000050	0.	0.	
9,400	47,000	.001550	.000050	0.	0.	
9,600	48,000	.001600	.000050	0.	0.	
9,800	49,000	.001700	.000100	0.	0.	Elastic limit.
10,000	50,000	.002200	.000500	0.	0.	
10,200	51,000	.004150	.001950	0.	0.	
10,400	52,000	.005600	.001450	0.	0.	
10,800	54,000	.007800	.002200	0.	0.	
11,200	56,000	.010000	.002200	0.	0.	
11,600	58,000	.011900	.001900	0.	0.	
12,000	60,000	.014250	.002350	0.	0.	
12,400	62,000	.016350	.002100	0.	0.	
17,360	86,800	.....	.....	0.	0.	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 86,800  
 Elastic limit per square inch of original section.....do... 49,000  
 Elongation per inch after rupture.....inch.. 0.2100  
 Elongation per inch under strain at elastic limit.....do... .001700  
 Reduction in diameter at point of rupture.....do... .135  
 Reduction in area after rupture, per centum of original section.....46.2  
 Position of rupture.....1" from neck  
 Character of broken surface.....silky  
 Elongation of inch sections.....".30", ".12

No. 3931.

Marks,  $\frac{32 R_{85} T}{B T_1 M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000300	.000200			
4,000	20,000	.000600	.000300			
6,000	30,000	.001000	.000400			
7,000	35,000	.001200	.000200	.000050	.000050	
8,000	40,000	.001350	.000150			
8,400	42,000	.001450	.000100	.000050	0.	
8,600	43,000	.001500	.000050			
8,800	44,000	.001500	0.			
9,000	45,000	.001550	.000050			Elastic limit.
9,200	46,000	.001600	.000050			
9,400	47,000	.001650	.000050			
9,600	48,000	.001800	.000150			
9,800	49,000	.001950	.000150			
10,000	50,000	.002250	.000300			
10,400	52,000	.004250	.002000			
10,800	54,000	.007000	.002750			
11,200	56,000	.007900	.000900			
11,600	58,000	.009850	.001950			
12,000	60,000	.012300	.002450			Tensile strength.
18,120	90,600					

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 90,600  
 Elastic limit per square inch of original section ..... do... 47,000  
 Elongation per inch after rupture ..... inch.. 0.2000  
 Elongation per inch under strain at elastic limit ..... do... 0.001650  
 Reduction in diameter at point of rupture ..... do... .085  
 Reduction in area after rupture, per centum of original section ..... 30.7  
 Position of rupture ..... ".75 from neck  
 Character of broken surface ..... granular, 60 per cent.; silky, serrated, 40 per cent.

No. 3939.

Marks,  $\frac{32 R_{50} T}{B T_{3} M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	.....	.....	
4,000	20,000	.000800	.000300	.....	.....	
6,000	30,000	.000900	.000300	.....	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001300	.000250	.....	.....	Elastic limit.
8,400	42,000	.001550	.000250	.000150	.000150	
8,600	43,000	.002600	.001050	.....	.....	
8,800	44,000	.005400	.002800	.....	.....	
9,000	45,000	.006200	.000800	.....	.....	
9,400	47,000	.008400	.002200	.....	.....	
9,800	49,000	.010400	.002000	.....	.....	Tensile strength.
10,200	51,000	.012600	.002200	.....	.....	
10,600	53,000	.014900	.002300	.....	.....	
11,000	55,000	.017000	.002100	.....	.....	
16,210	81,050	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 81,050  
 Elastic limit per square inch of original section.....do.. 42,000  
 Elongation per inch after rupture.....inch.. 0.2500  
 Elongation per inch under strain at elastic limit.....do.. .001550  
 Reduction in diameter at point of rupture.....do.. .125  
 Reduction in area after rupture, per centum of original section.....do.. 43.3  
 Position of rupture.....1".15 from neck  
 Character of broken surface.....silky  
 Elongation of inch sections.....".27, ".23

H. Ex. 165—2

No. 3941.

Marks,  $\frac{32 R_{56} T}{B T_1 M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	-----	
2,000	10,000	.000350	.000200	-----	-----	
4,000	20,000	.000600	.00 250	-----	-----	
6,000	30,000	.000950	.000350	-----	-----	
7,000	35,000	.001100	.000150	0.	-----	Elastic limit below 40,000 pounds per square inch.
8,000	40,000	.002550	.001450	.001350	.001350	
8,200	41,000	.004900	.002350	-----	-----	
8,400	42,000	.008050	.003150	-----	-----	
8,600	43,000	.009000	.000950	-----	-----	
8,800	44,000	.010050	.001050	-----	-----	
9,200	46,000	.012350	.002300	-----	-----	
9,600	48,000	.014750	.002400	-----	-----	
10,000	50,000	.017000	.002250	-----	-----	
10,400	52,000	.019400	.002400	-----	-----	
10,800	54,000	.022350	.002950	-----	-----	Tensile strength.
15,420	77,100	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 77,100  
 Elongation per inch after rupture ..... inch.. 0.2500  
 Reduction in diameter at point of rupture ..... do... .115  
 Reduction in area after rupture, per centum of original section ..... 40.3  
 Position of rupture ..... 1".10 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".20, ".30\*

No. 3884.

Marks,  $\frac{32 R_{55} T}{B T_5 M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000400	.000250			
4,000	20,000	.000750	.000350			
6,000	30,000	.001200	.000450			
7,000	35,000	.001350	.000150	.000100	.000100	
8,000	40,000	.001500	.000150			
8,400	42,000	.001550	.000050	.000100	0	
8,600	43,000	.001600	.000050			
8,800	44,000	.001650	.000050			
9,000	45,000	.001700	.000050			Elastic limit.
9,200	46,000	.004900	.003200			
9,400	47,000	.006600	.001700			
9,600	48,000	.008000	.001400			
10,000	50,000	.010350	.002350			
10,400	52,000	.012250	.001900			
10,800	54,000	.014500	.002250			
11,200	56,000	.017250	.002750			
11,600	58,000	.020000	.002750			
16,110	80,550					Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 80,550  
 Elastic limit per square inch of original section.....do... 45,000  
 Elongation per inch after rupture.....inch... .2400  
 Elongation per inch under strain at elastic limit.....do... .001700  
 Reduction in diameter at point of rupture.....do... .115  
 Reduction in area after rupture, per centum of original section.....do... 40.3  
 Position of rupture.....1" from neck  
 Character of broken surface.....silky, oblique, serrated  
 Elongation of inch sections.....".15 ".33\*

No. 3885.

Marks, <sup>32 R<sub>44</sub> T</sup><sub>B T<sub>6</sub> M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	.....	.....	
4,000	20,000	.000600	.000300	.....	.....	
6,000	30,000	.000900	.000300	.....	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001200	.000100	.....	.....	
8,400	42,000	.001300	.000100	0.	.....	
8,600	43,000	.001300	0.	.....	.....	
8,800	44,000	.001350	.000050	.....	.....	
9,000	45,000	.001350	0.	.....	.....	Elastic limit.
9,200	46,000	.007450	.006100	.....	.....	
9,400	47,000	.007850	.000400	.....	.....	
9,600	48,000	.008650	.000800	.....	.....	
10,000	50,000	.011000	.002350	.....	.....	
10,400	52,000	.013250	.002250	.....	.....	
10,800	54,000	.015350	.002100	.....	.....	
11,200	56,000	.017550	.002200	.....	.....	
11,600	58,000	.020000	.002450	.....	.....	
16,210	81,050	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 81,050  
 Elastic limit per square inch of original section ..... do... 45,000  
 Elongation per inch after rupture ..... inch... 0.2350  
 Elongation per inch under strain at elastic limit ..... do... .001350  
 Reduction in diameter at point of rupture ..... do... .115  
 Reduction in area after rupture, per centum of original section ..... 40.3  
 Position of rupture ..... ".65 from neck  
 Character of broken surface ..... silky, serrated  
 Elongation of inch sections ..... ".83", ".14



No. 3942.

Marks, <sup>32 R<sub>50</sub> T</sup><sub>M T, M</sub>Diameter, <sup>11</sup>/<sub>16</sub> .505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	.....	.....	
4,000	20,000	.000550	.000250	.....	.....	
6,000	30,000	.000900	.000350	0.	.....	
7,000	35,000	.001000	.000200	.....	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,400	42,000	.001350	.000050	0.	.....	
8,600	43,000	.001400	.000050	.....	.....	
8,800	44,000	.001400	0.	.....	.....	
9,000	45,000	.001450	.000050	.....	.....	Elastic limit.
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001500	0.	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	
9,800	49,000	.001600	.000050	.....	.....	
10,000	50,000	.001850	.000250	.....	.....	
10,200	51,000	.002450	.000600	.....	.....	
10,400	52,000	.003750	.001300	.....	.....	
10,800	54,000	.007000	.003250	.....	.....	
11,200	56,000	.008750	.001750	.....	.....	
11,600	58,000	.011500	.002750	.....	.....	Tensile strength.
12,000	60,000	.014000	.002500	.....	.....	
12,400	62,000	.016250	.002250	.....	.....	
17,580	87,900	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds ..	87,900
Elastic limit per square inch of original section .....	do ..	49,000
Elongation per inch after rupture .....	inch ..	0.2000
Elongation per inch under strain at elastic limit .....	do ..	.001600
Reduction in diameter at point of rupture .....	do ..	.125
Reduction in area after rupture, per centum of original section .....	.....	43.3
Position of rupture .....	" .60 from neck	
Character of broken surface .....	.....	silky
Elongation of inch sections .....	" .09, ".31 "	

No. 3943.

Marks, <sup>32 R<sub>55</sub> T</sup><sub>M T<sub>4</sub> M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, "2.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	.....	.....	
2,000	10,000	.000300	.000200	.....	.....	
4,000	20,000	.000550	.000250	.....	.....	
6,000	30,000	.000950	.000400	.....	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	.....	.....	
8,400	42,000	.001350	.000050	0.	.....	
8,600	43,000	.001350	0.	.....	.....	
8,800	44,000	.001400	.000050	.....	.....	Elastic limit.
9,000	45,000	.001450	.000050	.....	.....	
9,200	46,000	.002000	.000550	.....	.....	
9,400	47,000	.002700	.000700	.....	.....	
9,600	48,000	.003750	.001050	.....	.....	
10,000	50,000	.006900	.003150	.....	.....	
10,400	52,000	.009000	.002100	.....	.....	
10,800	54,000	.011400	.002400	.....	.....	
11,200	56,000	.012900	.001500	.....	.....	
17,340	86,700	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 86,700  
 Elastic limit per square inch of original section.....do... 45,000  
 Elongation per inch after rupture.....inch.. 0.2400  
 Elongation per inch under strain at elastic limit.....do... .001450  
 Reduction in diameter at point of rupture.....do... .125  
 Reduction in area after rupture, per centum of original section.....do... 43.3  
 Position of rupture....."1.10 from neck  
 Character of broken surface.....silky  
 Elongation of inch sections.....".30\*, ".18

No. 3886.

Marks,  $\frac{82 R_{80} T}{M T M}$ Diameter,  $\frac{1}{4}$  .505.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000200	.000200	0.	0.	
2,000	10,000	.000500	.000300	.....	.....	
4,000	20,000	.000850	.000350	.....	.....	
6,000	30,000	.001150	.000300	.....	.....	
7,000	35,000	.001350	.000200	.000050	.000050	
8,000	40,000	.001450	.000100	.....	.....	
8,400	42,000	.001500	.000050	.000100	.000050	
8,600	43,000	.001550	.000050	.....	.....	
8,800	44,000	.001550	0.	.....	.....	
9,000	45,000	.001600	.000050	.....	.....	
9,200	46,000	.001600	0.	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	
9,800	49,000	.001700	0.	.....	.....	Elastic limit.
10,000	50,000	.001750	.000050	.....	.....	
10,200	51,000	.001800	.000050	.....	.....	
10,400	52,000	.001800	.000100	.....	.....	
10,600	53,000	.002150	.000250	.....	.....	
10,800	54,000	.003200	.001050	.....	.....	
11,000	55,000	.005800	.002700	.....	.....	
11,400	57,000	.010000	.004100	.....	.....	
11,800	59,000	.012350	.002350	.....	.....	
12,200	61,000	.014750	.002400	.....	.....	
12,600	63,000	.017150	.002400	.....	.....	Tensile strength.
13,000	65,000	.019900	.002750	.....	.....	
17,300	86,500	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....	pounds..	86,500
Elastic limit per square inch of original section.....	do...	52,000
Elongation per inch after rupture.....	inch..	0.2600
Elongation per inch under strain at elastic limit.....	do...	.001900
Reduction in diameter at point of rupture.....	do...	.125
Reduction in area after rupture, per centum of original section.....	.....	43.3
Position of rupture.....	.....	1".15 from neck
Character of broken surface.....	.....	silky, serrated
Elongation of inch sections.....	.....	" 24, " 28"

No. 3822.

Marks,  $\frac{32 R_{ST}}{M T_{SM}}$ Diameter,  $\frac{1}{16}$  inch.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000350	.000250	0.	0.	
4,000	20,000	.000600	.000250	0.	0.	
6,000	30,000	.000950	.000350	0.	0.	
7,000	35,000	.001100	.000150	0.	0.	
8,000	40,000	.001350	.000250	0.	0.	
8,400	42,000	.001400	.000050	0.	0.	
8,600	43,000	.001450	.000050	0.	0.	
8,800	44,000	.001500	.000050	0.	0.	Elastic limit.
9,000	45,000	.003250	.001750	0.	0.	
9,200	46,000	.005250	.002000	0.	0.	
9,400	47,000	.006750	.001550	0.	0.	
9,800	49,000	.008200	.001450	0.	0.	
10,200	51,000	.010350	.002150	0.	0.	
10,600	53,000	.012500	.002150	0.	0.	
11,000	55,000	.014500	.002000	0.	0.	
11,400	57,000	.016750	.002250	0.	0.	
16,620	83,100	0.	0.	0.	0.	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 83,100  
 Elastic limit per square inch of original section.....do... 44,000  
 Elongation per inch after rupture.....inch... 0.225  
 Elongation per inch under strain at elastic limit.....do... .001500  
 Reduction in diameter at point of rupture.....do... .105  
 Reduction in area after rupture, per centum of original section..... 37.1  
 Position of rupture.....1" from neck  
 Character of broken surface.....silky, serrated  
 Elongation of inch sections.....".18, ".27\*

No. 3823.

Marks, <sup>82 R<sub>7</sub> T</sup>  
<sub>M T<sub>3</sub> M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	0.	
2,000	10,000	.000450	.000300	0.	0.	
4,000	20,000	.000850	.000400	0.	0.	
6,000	30,000	.001050	.000200	0.	0.	
7,000	35,000	.001300	.000250	0.	0.	
8,000	40,000	.001400	.000100	0.	0.	
8,400	42,000	.001450	.000050	.000050	.000050	
8,600	43,000	.001500	.000050	0.	0.	
8,800	44,000	.001500	0.	0.	0.	
9,000	45,000	.001550	.000050	0.	0.	Elastic limit.
9,200	46,000	.001600	.000050	0.	0.	
9,400	47,000	.002750	.001150	0.	0.	
9,600	48,000	.003750	.001000	0.	0.	
9,800	49,000	.004750	.001000	0.	0.	
10,200	51,000	.007250	.002500	0.	0.	
10,600	53,000	.009000	.001750	0.	0.	
11,000	55,000	.011750	.002750	0.	0.	
11,400	57,000	.014000	.002250	0.	0.	
11,800	59,000	.015600	.001600	0.	0.	
17,130	85,650	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 85,650  
 Elastic limit per square inch of original section.....do... 46,000  
 Elongation per inch after rupture.....inch.. 0.2500  
 Elongation per inch under strain at elastic limit.....do... .0016  
 Reduction in diameter at point of rupture.....do... .125  
 Reduction in area after rupture, per centum of original section.....do... 43.3  
 Position of rupture.....1".28 from neck  
 Character of broken surface.....silly, serrated  
 Elongation of inch sections....."28", ".22"

No. 3935.

Marks,  $\frac{32}{B} \frac{R_{50}}{T} \frac{M}{M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	.....	.....	
4,000	20,000	.000600	.000350	.....	.....	
6,000	30,000	.000950	.000350	.....	.....	
7,000	35,000	.001200	.000250	0.	.....	
8,000	40,000	.001350	.000150	.....	.....	
8,400	42,000	.001400	.000050	.000050	.000050	
8,600	43,000	.001450	.000050	.....	.....	Elastic limit.
8,800	44,000	.001950	.000500	.....	.....	
9,000	45,000	.005000	.003050	.....	.....	
9,200	46,000	.005850	.000850	.....	.....	
9,600	48,000	.008000	.002150	.....	.....	
10,000	50,000	.010000	.002000	.....	.....	
10,400	52,000	.012250	.002250	.....	.....	
10,800	54,000	.014400	.002150	.....	.....	
11,200	56,000	.016650	.002250	.....	.....	
16,500	82,500	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 82,500  
 Elastic limit per square inch of original section.....do... 43,000  
 Elongation per inch after rupture.....inch.. 0.1900  
 Elongation per inch under strain at elastic limit.....do... 0.001450  
 Reduction in diameter at point of rupture.....do... .105  
 Reduction in area after rupture, per centum of original section..... 37.1  
 Position of rupture.....at middle of stem  
 Character of broken surface.....silky  
 Elongation of inch sections.....".23, ".15

No. 3936.

Marks,  $\frac{32}{B} \frac{R_{60}}{T} \frac{M}{M}$ Diameter,  $\frac{1}{2}$  inch.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	-----	
2,000	10,000	.000300	.000200	-----	-----	
4,000	20,000	.000600	.000300	-----	-----	
6,000	30,000	.001000	.000400	-----	-----	
7,000	35,000	.001150	.000150	0.	-----	Elastic limit.
8,000	40,000	.001300	.000150	-----	-----	
8,400	42,000	.001400	.000100	0.	-----	
8,600	43,000	.002400	.001000	-----	-----	
8,800	44,000	.002900	.000500	-----	-----	
9,000	45,000	.003500	.000600	-----	-----	
9,400	47,000	.003250	.002750	-----	-----	
9,800	49,000	.007800	.001650	-----	-----	
10,200	51,000	.010050	.002150	-----	-----	
10,600	53,000	.012050	.002000	-----	-----	
11,000	55,000	.013900	.001850	-----	-----	Tensile strength.
17,200	86,000	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 86,000  
 Elastic limit per square inch of original section ..... do.. 42,000  
 Elongation per inch after rupture ..... inch.. 0.2400  
 Elongation per inch under strain at elastic limit ..... do.. .001400  
 Reduction in diameter at point of rupture ..... do.. .115  
 Reduction in area after rupture, per centum of original section ..... 40.3  
 Position of rupture ..... ".60 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".33", ".15

No. 3849.

Marks,  $\frac{32 R_{64} T}{B T_3 M}$ Diameter,  $\frac{1}{2}$  .505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000300	.000250	.....	.....	
4,000	20,000	.000550	.000250	.....	.....	
6,000	30,000	.001000	.000450	.....	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001450	.000300	.....	.....	
8,400	42,000	.001500	.000050	.000050	.000050	
8,600	43,000	.001500	0.	.....	.....	
8,800	44,000	.001550	.000050	.....	.....	
9,000	45,000	.001600	.000050	.....	.....	Elastic limit.
9,200	46,000	.001800	.000200	.....	.....	
9,400	47,000	.002500	.000700	.....	.....	
9,600	48,000	.004250	.001750	.....	.....	
10,000	50,000	.005500	.001250	.....	.....	
10,400	52,000	.008500	.003000	.....	.....	
10,800	54,000	.011500	.003000	.....	.....	
11,200	56,000	.013250	.001750	.....	.....	
11,600	58,000	.016000	.002750	.....	.....	
17,210	86,050	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 86,050  
 Elastic limit per square inch of original section.....do.... 45,000  
 Elongation per inch after rupture.....inch.... 0.2250  
 Elongation per inch under strain at elastic limit.....do.... .001600  
 Reduction in diameter at point of rupture.....do.... .125  
 Reduction in area after rupture, per centum of original section.....do.... 46.3  
 Position of rupture.....1" from neck  
 Character of broken surface.....silky  
 Elongation of inch sections.....".13, ".32\*



No. 3850.

Marks, <sup>32 R<sub>4</sub>T</sup><sub>B T M</sub>Diameter, <sup>11</sup>/<sub>16</sub>.505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	.....	.....	
4,000	20,000	.000600	.000350	.....	.....	
6,000	30,000	.000900	.000300	.....	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,400	42,000	.001400	.000100	0.	.....	
8,600	43,000	.001400	0.	.....	.....	
8,800	44,000	.001450	.000050	.....	.....	Elastic limit.
9,000	45,000	.001500	.000050	.....	.....	
9,200	46,000	.004600	.003100	.....	.....	
9,400	47,000	.006400	.001800	.....	.....	
9,600	48,000	.007600	.001200	.....	.....	
10,000	50,000	.009500	.001900	.....	.....	
10,400	52,000	.012000	.002500	.....	.....	
10,800	54,000	.013500	.001500	.....	.....	
11,200	56,000	.016550	.003050	.....	.....	
11,600	58,000	.018750	.002200	.....	.....	Tensile strength.
16,460	82,300	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 82,300  
 Elastic limit per square inch of original section.....do... 45,000  
 Elongation per inch after rupture.....inch... 0.2450  
 Elongation per inch under strain at elastic limit.....do... 0.001500  
 Reduction in diameter at point of rupture.....do... .135  
 Reduction in area after rupture, per centum of original section.....do... 46.2  
 Position of rupture.....at middle of stem  
 Character of broken surface.....silky  
 Elongation of inch sections....." 25\*, " 24\*

No. 3851.

Marks,  $\frac{32 R_{et} T}{M T_2 M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000250	.000150	-----	-----	
4,000	20,000	.000600	.000350	-----	-----	
6,000	30,000	.000950	.000350	-----	-----	
7,000	35,000	.001150	.000200	0.	-----	
8,000	40,000	.001350	.000200	-----	-----	
8,400	42,000	.001400	.000050	0.	-----	
8,600	43,000	.001450	.000050	-----	-----	
8,800	44,000	.001550	.000100	-----	-----	
9,000	45,000	.001600	.000050	-----	-----	Elastic limit.
9,200	46,000	.001600	0.	-----	-----	
9,400	47,000	.001650	.000050	-----	-----	
9,600	48,000	.001650	0.	-----	-----	
9,800	49,000	.001700	.000050	-----	-----	
10,000	50,000	.001700	0.	-----	-----	
10,200	51,000	.002050	.000350	-----	-----	
10,400	52,000	.004750	.002700	-----	-----	
10,600	53,000	.005600	.000850	-----	-----	
11,000	55,000	.008100	.002500	-----	-----	
11,400	57,000	.009750	.001650	-----	-----	Tensile strength.
11,800	59,000	.011500	.001750	-----	-----	
12,200	61,000	.013750	.002250	-----	-----	
12,600	63,000	.015500	.001750	-----	-----	
18,810	91,550	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 91,550  
 Elastic limit per square inch of original section ..... do.. 50,000  
 Elongation per inch after rupture ..... inch.. 0.2100  
 Elongation per inch under strain at elastic limit ..... do.. .001700  
 Reduction in diameter at point of rupture ..... .115  
 Reduction in area after rupture, per centum of original section ..... 40.3  
 Position of rupture ..... ".65 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".12, ".30\*

No. 3852.

Marks, <sup>32 R<sub>34</sub> T</sup><sub>M T<sub>1</sub> M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000250	.000150	.....	.....	
4,000	20,000	.000550	.000300	.....	.....	
6,000	30,000	.000900	.000350	.....	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,400	42,000	.001350	.000050	0.	.....	
8,600	43,000	.001400	.000050	.....	.....	
8,800	44,000	.001450	.000050	.....	.....	
9,000	45,000	.001500	.000050	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001550	0.	.....	.....	
9,800	49,000	.001600	.000050	.....	.....	
10,000	50,000	.001600	0.	.....	.....	
10,200	51,000	.001850	.000250	.....	.....	Elastic limit.
10,400	52,000	.004000	.002150	.....	.....	
10,600	53,000	.005500	.001500	.....	.....	
11,000	55,000	.007600	.002100	.....	.....	
11,400	57,000	.009600	.002000	.....	.....	
11,800	59,000	.011750	.002150	.....	.....	
12,200	61,000	.013000	.001250	.....	.....	Tensile strength.
12,800	63,000	.015000	.002000	.....	.....	
18,110	90,550	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 90,550  
 Elastic limit per square inch of original section.....do.. 50,000  
 Elongation per inch after rupture.....inch.. 0.2200  
 Elongation per inch under strain at elastic limit.....do.. .001600  
 Reduction in diameter at point of rupture.....do.. .135  
 Reduction in area after rupture, per centum of original section.....do.. 46.2  
 Position of rupture.....".80 from neck  
 Character of broken surface.....silly  
 Elongation of inch sections.....".11, ".33"

No. 3932.

Marks,  $\frac{32 R_{0.8} T}{B T M}$ Diameter,  $\frac{1}{2}$  .505.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	-----	
2,000	10,000	.000300	.000200	-----	-----	
4,000	20,000	.000700	.000400	-----	-----	
6,000	30,000	.001050	.000350	-----	-----	
7,000	35,000	.001200	.000150	0.	-----	
8,000	40,000	.001450	.000250	-----	-----	
8,400	42,000	.001500	.000050	.000100	.000100	
8,600	43,000	.001550	.000050	-----	-----	
8,800	44,000	.001600	.000050	-----	-----	
9,000	45,000	.001600	0.	-----	-----	
9,200	46,000	.001650	.000050	-----	-----	
9,400	47,000	.001700	.000050	-----	-----	
9,600	48,000	.001750	.000050	-----	-----	
9,800	49,000	.001750	0.	-----	-----	
10,000	50,000	.001850	.000100	-----	-----	Elastic limit.
10,200	51,000	.002050	.000200	-----	-----	
10,400	52,000	.003200	.001150	-----	-----	
10,600	53,000	.005000	.001800	-----	-----	
11,000	55,000	.007350	.002350	-----	-----	
11,400	57,000	.009850	.002500	-----	-----	
11,800	59,000	.011750	.001900	-----	-----	
12,200	61,000	.013900	.002150	-----	-----	
12,600	63,000	.015850	.001950	-----	-----	
17,980	89,900	-----	-----	-----	-----	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....pounds.. 89,900  
 Elastic limit per square inch of original section .....do... 50,000  
 Elongation per inch after rupture .....inch.. 0.2300  
 Elongation per inch under strain at elastic limit .....do... 0.001850  
 Reduction in diameter at point of rupture .....do... .125  
 Reduction in area after rupture, per centum of original section ..... 43.3  
 Position of rupture ..... "65 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... "12, "34\*

No. 3815.

Marks,  $32 R_{ss} T$   
 $T_1 M$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	0.	
2,000	10,000	.000250	.000200	.....	.....	
4,000	20,000	.000350	.000400	.....	.....	
6,000	30,000	.001000	.000350	.....	.....	
8,000	40,000	.001350	.000350	0.	0.	
9,200	46,000	.001550	.000200	.000050	.000050	
9,400	47,000	.001550	0.	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	
10,000	50,000	.001750	.000100	.....	.....	Elastic limit.
10,200	51,000	.001950	.000200	.....	.....	
10,400	52,000	.002600	.000650	.....	.....	
10,600	53,000	.003700	.001100	.....	.....	
11,000	55,000	.005900	.002200	.....	.....	
11,400	57,000	.007650	.001750	.....	.....	
11,800	59,000	.009900	.002250	.....	.....	
12,200	61,000	.011550	.001650	.....	.....	
12,600	63,000	.013400	.001850	.....	.....	
18,920	94,600	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 94,600  
 Elastic limit per square inch of original section ..... do... 50,000  
 Elongation per inch after rupture ..... inch... 0.2500  
 Elongation per inch under strain at elastic limit ..... do... .001750  
 Reduction in diameter at point of rupture ..... do... .135  
 Reduction in area after rupture, per centum of original section ..... 46.2  
 Position of rupture ..... ".90 from neck  
 Character of broken surface ..... silky, trace of granulation  
 Elongation of inch sections ..... ".34", ".16

H. Ex. 165—3

No. 3940.

Marks,  $\frac{32}{B} \frac{R_{32}}{T} \frac{T}{M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000150	.000150	0.	-----	
2,000	10,000	.000450	.000300	-----	-----	
4,000	20,000	.000950	.000500	-----	-----	
6,000	30,000	.001300	.000350	-----	-----	
7,000	35,000	.001500	.000200	0.	-----	
8,000	40,000	.001650	.000150	0.	-----	
8,400	42,000	.001700	.000050	-----	-----	
8,600	43,000	.001700	0.	-----	-----	
8,800	44,000	.001800	.000100	-----	-----	Elastic limit.
9,000	45,000	.002050	.000250	-----	-----	
9,200	46,000	.004050	.002000	-----	-----	
9,400	47,000	.005550	.001500	-----	-----	
9,800	49,000	.008000	.002450	-----	-----	
10,200	51,000	.011050	.003050	-----	-----	
10,600	53,000	.012250	.001200	-----	-----	
11,000	55,000	.014550	.002300	-----	-----	
11,400	57,000	.016900	.002350	-----	-----	
16,690	83,450	-----	-----	-----	-----	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 83,450  
 Elastic limit per square inch of original section ..... do... 44,000  
 Elongation per inch after rupture ..... inch.. 0.2500  
 Elongation per inch under strain at elastic limit ..... do... .001800  
 Reduction in diameter at point of rupture ..... do... .1250  
 Reduction in area after rupture, per centum of original section ..... 43.3  
 Position of rupture ..... 1" from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".17, ".33

No. 3934.

Marks,  $\frac{32 R}{B T} \frac{T}{M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000250	.000150	0.	0.	
4,000	20,000	.000650	.000400	0.	0.	
6,000	30,000	.001050	.000400	0.	0.	
7,000	35,000	.001250	.000200	0.	0.	
8,000	40,000	.001350	.000100	0.	0.	
8,400	42,000	.001400	.000050	0.	0.	
8,600	43,000	.001450	.000050	0.	0.	
8,800	44,000	.001450	0.	0.	0.	
9,000	45,000	.001500	.000050	0.	0.	
9,200	46,000	.001500	0.	0.	0.	
9,400	47,000	.001550	.000050	0.	0.	Elastic limit.
9,600	48,000	.001700	.000150	0.	0.	
9,800	49,000	.002600	.001100	0.	0.	
10,000	50,000	.004250	.001650	0.	0.	
10,400	52,000	.006350	.002100	0.	0.	
10,800	54,000	.008100	.001750	0.	0.	
11,200	56,000	.009900	.001800	0.	0.	
11,600	58,000	.011750	.001850	0.	0.	
12,000	60,000	.013100	.001350	0.	0.	
18,010	90,050	0.	0.	0.	0.	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 90,050  
 Elastic limit per square inch of original section ..... do... 47,000  
 Elongation per inch after rupture ..... inch... 0.2000  
 Elongation per inch under strain at elastic limit ..... do... .001550  
 Reduction in diameter at point of rupture ..... do... .115  
 Reduction in area after rupture, per centum of original section ..... 40.2  
 Position of rupture ..... 1".00 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".27", ".13

No. 3970.

Marks, <sup>32 R<sub>0</sub> T</sup>  
<sub>BT<sub>2</sub> M</sub>Diameter, <sup>1</sup>/<sub>16</sub> .505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000300	.000200	.....	.....	
4,000	20,000	.000550	.000250	.....	.....	
6,000	30,000	.001000	.000450	.....	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001400	.000250	.....	.....	
8,400	42,000	.001450	.000050	0.	.....	Elastic limit.
8,600	43,000	.002500	.001050	.....	.....	
8,800	44,000	.003200	.000700	.....	.....	
9,000	45,000	.005500	.002300	.....	.....	
9,400	47,000	.007400	.001900	.....	.....	
9,800	49,000	.009500	.002100	.....	.....	
10,200	51,000	.011500	.002000	.....	.....	
10,600	53,000	.013500	.002000	.....	.....	
11,000	55,000	.015350	.001850	.....	.....	
16,830	84,150	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 84,150  
 Elastic limit per square inch of original section ..... do... 42,000  
 Elongation per inch after rupture ..... inch... 0.2150  
 Elongation per inch under strain at elastic limit ..... do... .001450  
 Reduction of diameter at point of rupture ..... do... .105  
 Reduction in area after rupture, per centum of original section..... 37.1  
 Position of rupture..... ".60 from neck  
 Character of broken surface..... silky, serrated; granular in part at the circumference  
 Elongation of inch sections ..... ".12, ".31\*



No. 3971.

Marks, <sup>32 R, T</sup><sub>B T, M</sub>Diameter,  $\frac{1}{16}$ .505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000350	.000250	.....	.....	
4,000	20,000	.000600	.000250	.....	.....	
6,000	30,000	.000900	.000300	.....	.....	
7,000	35,000	.001050	.000150	0.	.....	Elastic limit.
8,000	40,000	.001250	.000200	.....	.....	
8,400	42,000	.001400	.000150	0.	.....	
8,600	43,000	.001600	.000200	.....	.....	
8,800	44,000	.002500	.001900	.....	.....	
9,000	45,000	.004250	.000750	.....	.....	
9,400	47,000	.006500	.002250	.....	.....	
9,800	49,000	.008250	.001750	.....	.....	
10,200	51,000	.010250	.002000	.....	.....	
10,600	53,000	.012500	.002250	.....	.....	
11,000	55,000	.014350	.001850	.....	.....	Tensile strength.
16,810	84,050	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 84,050  
 Elastic limit per square inch of original section.....do.. 42,000  
 Elongation per inch after rupture.....inch.. 0.1950  
 Elongation per inch under strain at elastic limit.....do.. 0.01400  
 Reduction in diameter at point of rupture.....do.. .105  
 Reduction in area after rupture, per centum of original section..... 37.1  
 Position of rupture.....".60 from neck  
 Character of broken surface.....silky; serrated; granular in part at circumference  
 Elongation of inch sections.....".27", ".12

No. 3972.

Marks,  $\frac{32}{M} R_{70} T$  $\frac{M}{T_s M}$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000350	.000250	.....	.....	
4,000	20,000	.000600	.000250	.....	.....	
6,000	30,000	.001000	.000400	.....	.....	
7,000	35,000	.001150	.000150	0.	0.	
8,000	40,000	.001400	.000250	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	
8,800	44,000	.002400	.000900	.....	.....	
9,000	45,000	.005350	.002950	.....	.....	
9,200	46,000	.007250	.001900	.....	.....	
9,600	48,000	.009600	.002350	.....	.....	
10,000	50,000	.011900	.002300	.....	.....	
10,400	52,000	.014000	.002100	.....	.....	Elastic limit.
10,800	54,000	.016400	.002400	.....	.....	
11,200	56,000	.019000	.002600	.....	.....	
16,190	80,950	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 80,950  
 Elastic limit per square inch of original section.....do... 43,000  
 Elongation per inch after rupture.....inch.. 0.2400  
 Elongation per inch under strain at elastic limit.....do... .001500  
 Reduction in area after rupture.....do... .115  
 Reduction in area after rupture, per centum of original section.....40.3  
 Position of rupture.....1".10 from neck  
 Character of broken surface.....silky; serrated  
 Elongation of inch sections.....".18, ".30"

No. 3973.

Marks,  $\frac{82 R_{70} T}{M T_1 M}$ Diameter,  $\frac{1}{4}$  505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation. per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000650	.000250	.....	.....	
6,000	30,000	.001000	.000350	.....	.....	
7,000	35,000	.001200	.000200	.000050	.000050	Elastic limit.
8,000	40,000	.001400	.000200	.....	.....	
8,400	42,000	.001450	.000050	.000150	.000100	
8,600	43,000	.005850	.004400	.....	.....	
8,800	44,000	.007100	.001250	.....	.....	
9,000	45,000	.008000	.000900	.....	.....	
9,400	47,000	.010250	.002250	.....	.....	
9,800	49,000	.012500	.002250	.....	.....	
10,200	51,000	.014850	.002350	.....	.....	
10,600	53,000	.017400	.002550	.....	.....	
11,000	55,000	.020250	.002850	.....	.....	Tensile strength.
16,020	80,100	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 80,100  
 Elastic limit per square inch of original section ..... do... 42,000  
 Elongation per inch after rupture ..... inch... 0.2450  
 Elongation per inch under strain at elastic limit ..... do... .001450  
 Reduction in diameter at point of rupture ..... do... .125  
 Reduction in area after rupture, per centum of original section ..... 43.3  
 Position of rupture ..... 1" from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".33\*, ".16

No. 3933.

Marks, <sup>32 R, T</sup><sub>B T, M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, "2.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
300	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	-----	
2,000	10,000	.000250	.000150	-----	-----	
4,000	20,000	.000650	.000300	-----	-----	
6,000	30,000	.000950	.000400	-----	-----	
7,000	35,000	.001100	.000150	.000050	.000050	
8,000	40,000	.001250	.000150	-----	-----	
8,400	42,000	.001350	.000100	.000050	0.	
8,600	43,000	.001400	.000050	-----	-----	
8,800	44,000	.001400	0.	-----	-----	
9,000	45,000	.001450	.000050	-----	-----	Elastic limit.
9,200	46,000	.001500	.000050	-----	-----	
9,400	47,000	.001500	0.	-----	-----	
9,600	48,000	.002250	.000750	-----	-----	
9,800	49,000	.002900	.000650	-----	-----	
10,000	50,000	.004900	.002000	-----	-----	
10,400	52,000	.007400	.002500	-----	-----	
10,800	54,000	.009500	.002100	-----	-----	
11,200	56,000	.011750	.002250	-----	-----	
11,600	58,000	.013600	.001850	-----	-----	
12,000	60,000	.015500	.001900	-----	-----	Tensile strength.
17,370	86,850	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 86,850  
 Elastic limit per square inch of original section .....do... 47,000  
 Elongation per inch after rupture .....inch.. 0.2000  
 Elongation per inch under strain at elastic limit.....do... .001500  
 Reduction in diameter at point of rupture.....do... .085  
 Reduction in area after rupture, per centum of original section .....do... 30.7  
 Position of rupture .....".60 from neck  
 Character of broken surface, granular, radiating from a dull spot in the circumference; opened cracks  
 in surface of stem.  
 Elongation of inch sections.....".28\* ".12

No. 3845.

Marks, <sup>32 R, T</sup><sub>B T, M</sub>Diameter, <sup>11</sup>/<sub>16</sub>.505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	.....	.....	
4,000	20,000	.000550	.000250	.....	.....	
6,000	30,000	.001000	.000450	.....	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	.....	.....	
8,400	42,000	.001350	.000050	.000050	.000050	
8,600	43,000	.001400	.000050	.....	.....	
8,800	44,000	.001450	.000050	.....	.....	
9,000	45,000	.001500	.000050	.....	.....	Elastic limit.
9,200	46,000	.002250	.000750	.....	.....	
9,400	47,000	.003400	.001150	.....	.....	
9,600	48,000	.005000	.001600	.....	.....	
10,000	50,000	.007150	.002150	.....	.....	
10,400	52,000	.009250	.002100	.....	.....	
10,800	54,000	.011350	.002100	.....	.....	
11,200	56,000	.013350	.002000	.....	.....	
11,600	58,000	.015600	.002250	.....	.....	
16,980	84,900	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 84,900  
 Elastic limit per square inch of original section ..... do ... 45,000  
 Elongation per inch after rupture ..... inch.. 0.2500  
 Elongation per inch under strain at elastic limit ..... do ... .001500  
 Reduction in diameter at point of rupture ..... do ... .155  
 Reduction in area after rupture, per centum of original section ..... 51.9  
 Position of rupture ..... 1" from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".37", ".13

No. 3825.

Marks, <sup>32 R G C</sup><sub>T, M</sub>Diameter, <sup>11</sup>/<sub>16</sub>.505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	0.	
2,000	10,000	.000400	.000250			
6,000	30,000	.001000	.000600			
10,000	50,000	.001650	.000650			
12,000	60,000	.002050	.000400	.000050	.000050	
14,000	70,000	.002400	.000350			
14,200	71,000	.002500	.000100			
14,400	72,000	.002600	.000100			
14,600	73,000	.002700	.000100			Elastic limit.
14,800	74,000	.002800	.000200			
15,000	75,000	.003050	.000150			
15,200	76,000	.003350	.000300			
15,600	78,000	.004000	.000650			
16,000	80,000	.004750	.000750			
16,400	82,000	.005850	.001100			
16,800	84,000	.006850	.001000			
17,200	86,000	.008250	.001400			
26,170	130,850					Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 130,850  
 Elastic limit per square inch of original section.....do... 73,000  
 Elongation per inch after rupture.....inch.. 0.1450  
 Elongation per inch under strain at elastic limit.....do... .002700  
 Reduction in diameter at point of rupture.....do... .085  
 Reduction in area after rupture, per centum of original section.....do... 30.7  
 Position of rupture.....1" .10 from neck.  
 Character of broken surface.....granular, 557 per cent.; silky, 45 per cent  
 Elongation of inch sections.....".18, ".11

No. 3937.

Marks, <sup>82</sup>R G O  
<sub>T<sub>2</sub>M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	.....	.....	
6,000	30,000	.001100	.000750	.....	.....	
10,000	50,000	.001750	.000650	.....	.....	
12,000	60,000	.002100	.000350	0.	.....	
14,000	70,000	.002450	.000350	.000050	.000050	
14,200	71,000	.002550	.000100	.....	.....	
14,400	72,000	.002600	.000050	.....	.....	
14,600	73,000	.002650	.000050	.....	.....	
14,800	74,000	.002750	.000100	.....	.....	
15,000	75,000	.002900	.000150	.....	.....	Elastic limit.
15,200	76,000	.003100	.000200	.....	.....	
15,400	77,000	.003400	.000300	.....	.....	
15,800	79,000	.004050	.000650	.....	.....	
16,200	81,000	.004950	.000900	.....	.....	
16,600	83,000	.006050	.001100	.....	.....	
17,000	85,000	.007400	.001350	.....	.....	
17,400	87,000	.008450	.001050	.....	.....	
26,420	132,100	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 132,100  
 Elastic limit per square inch of original section.....do... 74,000  
 Elongation per inch after rupture.....inch.. 0.1400  
 Elongation per inch under strain at elastic limit.....do... .002750  
 Reduction in diameter at point of rupture.....do... .085  
 Reduction in area after rupture, per centum of original section.....do... 30.7  
 Position of rupture.....".80 from neck  
 Character of broken surface.....granular; silky center  
 Elongation of inch sections.....".20", ".08

No. 3938.

Marks, <sup>32 R G C</sup><sub>T<sub>3</sub> M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000300	.000200	0.	0.	
6,000	30,000	.000900	.000600	0.	0.	
10,000	50,000	.001600	.000700	0.	0.	
12,000	60,000	.001950	.000350	0.	0.	
14,000	70,000	.002300	.000350	0.	0.	
14,200	71,000	.002350	.000050	0.	0.	
14,400	72,000	.002400	.000050	0.	0.	
14,600	73,000	.002400	0.	0.	0.	
14,800	74,000	.002450	.000050	0.	0.	
15,000	75,000	.002500	.000050	0.	0.	
15,200	76,000	.002550	.000050	0.	0.	
15,400	77,000	.002550	0.	0.	0.	Elastic limit.
15,600	78,000	.002600	.000050	0.	0.	
15,800	79,000	.002800	.000200	0.	0.	
16,000	80,000	.003000	.000200	0.	0.	
16,200	81,000	.003250	.000250	0.	0.	
16,600	83,000	.003800	.000550	0.	0.	
17,000	85,000	.005050	.001250	0.	0.	
17,400	87,000	.006500	.001450	0.	0.	
17,800	89,000	.007750	.001250	0.	0.	
18,200	91,000	.008900	.001150	0.	0.	
26,770	133,850	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 133,850  
 Elastic limit per square inch of original section ..... do... 78,000  
 Elongation per inch after rupture ..... inch... 0".1450  
 Elongation per inch under strain at elastic limit ..... do... ".002600  
 Reduction in diameter at point of rupture ..... do... ".085  
 Reduction in area after rupture, per centum of original section ..... 30.7  
 Position of rupture ..... ".75 from neck  
 Character of broken surface ..... granular; silky spot at circumference  
 Elongation of inch sections ..... ".22, ".07





No. 3870.

Marks, <sup>32</sup>R<sub>5</sub> G CT<sub>2</sub> M

Diameter, 1.505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000300	.000250	.....	.....	
6,000	30,000	.000950	.000650	.....	.....	
10,000	50,000	.001800	.000650	.....	.....	
12,000	60,000	.001950	.000350	0.	.....	
14,000	70,000	.002350	.000400	0.	.....	
14,200	71,000	.002400	.000050	.....	.....	
14,400	72,000	.002450	.000050	.....	.....	
14,600	73,000	.002550	.000050	.....	.....	
14,800	74,000	.002550	.000050	.....	.....	
15,000	75,000	.002550	0.	.....	.....	
15,200	76,000	.002700	.000150	.....	.....	
15,400	77,000	.002800	.000100	.....	.....	
15,600	78,000	.002850	.000050	.....	.....	Elastic limit.
15,800	79,000	.002950	.000100	.....	.....	
16,000	80,000	.003050	.000100	.....	.....	
16,200	81,000	.003250	.000200	.....	.....	
16,400	82,000	.003450	.000200	.....	.....	
16,600	83,000	.003700	.000250	.....	.....	
17,000	85,000	.004100	.000400	.....	.....	
17,400	87,000	.005100	.001000	.....	.....	
17,800	89,000	.006100	.001000	.....	.....	
18,200	91,000	.007100	.001000	.....	.....	
18,600	93,000	.008250	.001150	.....	.....	Tensile strength.
27,980	189,900	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 189,900  
 Elastic limit per square inch of original section.....do... 80,000  
 Elongation per inch after rupture.....inch.. 0.1800  
 Elongation per inch under strain at elastic limit.....do... 0.080505  
 Reduction in diameter at point of rupture.....do... .05  
 Reduction in area after rupture, per centum of original section.....20.5  
 Position of rupture.....".40 from neck  
 Character of broken surface.....granular; dull spot at circumference  
 Elongation of inch sections.....".05, ".13\*

No. 3878.

Marks,  $\frac{32}{T_s} R_{M} G C$ Diameter,  $\frac{1}{8}$  .505.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	.....	.....	
6,000	30,000	.001050	.000750	.....	.....	
10,000	50,000	.001700	.000650	.....	.....	
12,000	60,000	.002050	.000350	.000050	.000050	
14,000	70,000	.002400	.000350	.000050	0.	
14,200	71,000	.002450	.000050	.....	.....	
14,400	72,000	.002500	.000050	.....	.....	
14,800	74,000	.002550	.000050	.....	.....	
15,000	75,000	.002600	.000050	.....	.....	
15,200	76,000	.002700	.000100	.....	.....	
15,400	77,000	.002800	.000100	.....	.....	Elastic limit.
15,600	78,000	.003000	.000200	.....	.....	
15,800	79,000	.003250	.000250	.....	.....	
16,000	80,000	.003550	.000300	.....	.....	
16,400	82,000	.004300	.000750	.....	.....	
16,800	84,000	.005200	.000900	.....	.....	
17,200	86,000	.006300	.001100	.....	.....	
17,600	88,000	.007350	.001050	.....	.....	
18,000	90,000	.008650	.001300	.....	.....	
27,280	136,400	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 136,400  
 Elastic limit per square inch of original section ..... do... 77,000  
 Elongation per inch after rupture ..... inch.. 0.1400  
 Elongation per inch under strain at elastic limit ..... do... .002800  
 Reduction in diameter at point of rupture ..... do... .065  
 Reduction in area after rupture, per centum of original section ..... 23.9  
 Position of rupture ..... ".75 from neck  
 Character of broken surface ..... granular; dull eccentric spot\*  
 Elongation of inch sections ..... ".08, ".20t

No. 3820.

Marks, <sup>32 R, G C</sup><sub>T, M</sub>Diameter, <sup>11</sup>/.505.

Sectional area, 20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100.	0.	0.	
2,000	10,000	.000350	.000250	.....	.....	
6,000	30,000	.001050	.000700	.....	.....	
10,000	50,000	.001750	.000700	.....	.....	
12,000	60,000	.002100	.000350	0.	.....	Elastic limit (approximate).
14,000	70,000	.002950	.000850	.000500	.000500	
14,200	71,000	.003250	.000300	.....	.....	
14,400	72,000	.003500	.000250	.....	.....	
14,600	73,000	.003750	.000250	.....	.....	
15,000	75,000	.004600	.000850	.....	.....	
15,400	77,000	.005650	.001050	.....	.....	
15,800	79,000	.006750	.001100	.....	.....	
16,200	81,000	.007700	.000950	.....	.....	
16,600	83,000	.009000	.001300	.....	.....	
25,810	129,050	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 129,050  
 Elastic limit per square inch of original section (approximate).....do... 70,000  
 Elongation per inch after rupture.....inch... 0.1450  
 Elongation per inch under strain at elastic limit.....do... .002950  
 Reduction in diameter at point of rupture.....do... .075  
 Reduction in area after rupture, per centum of original section..... 27.4  
 Position of rupture.....".95 from neck  
 Character of broken surface.....granular; silky center  
 Elongation of inch sections.....".10, ".19"

## 3.2-INCH STEEL B. L. RIFLES.

## SPECIFIC GRAVITY AND HARDNESS OF TUBES AND JACKETS.

Number of rifle.	Marks on specimen.	Specific gravity.	Hardness.
51	32 R <sub>51</sub> T B R <sub>3</sub> M	7.8539	17.26
56	32 R <sub>51</sub> T B R <sub>3</sub> M	7.8555	16.90
66	32 R <sub>56</sub> T B R <sub>3</sub> M	7.8508	18.58
68	32 R <sub>56</sub> T B R <sub>3</sub> M	7.8544	16.82
75	31 R <sub>75</sub> T B R <sub>3</sub> M	7.8540	15.36
51	32 R <sub>51</sub> J R <sub>3</sub> M	7.8516	19.29
56	32 R <sub>56</sub> J R <sub>3</sub> M	7.8470	16.81
61	32 R <sub>61</sub> J R <sub>3</sub> M	7.8465	17.81
68	32 R <sub>68</sub> J R <sub>3</sub> M	7.8457	17.81
71	32 R <sub>71</sub> J R <sub>3</sub> M	7.8524	18.98

## TABULATION OF SPECIMENS FROM 3.2-INCH B. L. STEEL RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			<i>Pounds.</i>	<i>Pounds.</i>	<i>Per ct.</i>	<i>Per ct.</i>	
3866	Tube No. 54...	Middle...	49,000	86,800	21.0	46.2	Silky.
3931	Tube No. 55...	do	47,000	90,600	20.0	30.7	Granular, 60 per cent.; silky serrated, 40 per cent.
3939	Tube No. 56...	do	42,000	81,050	25.0	43.3	Silky.
3941	do	do	*40,000	77,100	25.0	40.3	Do.
3884	do	do	46,000	80,550	24.0	40.3	Silky serrated.
3885	do	do	45,000	81,050	23.5	40.3	Do.
3942	do	do	49,000	87,900	20.0	43.3	Do.
3943	do	do	45,000	86,700	24.0	43.3	Do.
3886	do	do	52,000	86,500	26.0	43.3	Do.
3822	Tube No. 57...	do	44,000	83,100	22.5	37.1	Do.
3823	do	do	46,000	85,650	25.0	43.3	Do.
3935	Tube No. 60...	do	43,000	82,500	19.0	37.1	Do.
3936	do	do	42,000	86,000	24.0	40.3	Do.
3849	Tube No. 64...	do	45,000	86,050	22.5	43.3	Do.
3860	do	do	45,000	83,300	24.5	46.2	Do.
3851	do	do	50,000	91,550	21.0	40.3	Do.
3852	do	do	50,000	90,550	22.0	46.2	Do.
3932	Tube No. 66...	do	50,000	89,900	23.0	43.3	Do.
3815	do	do	50,000	94,600	25.0	46.2	Silky, trace of granulation.
3940	Tube No. 68...	do	44,000	83,450	25.0	43.3	Do.
3934	Tube No. 69...	do	47,000	90,050	20.0	40.3	Do.
3970	Tube No. 70...	do	42,000	84,150	21.5	37.1	Silky serrated and granular.
3971	do	do	42,000	84,050	19.5	37.1	Do.
3972	do	do	43,000	80,950	24.0	40.3	Silky serrated.
3973	do	do	42,000	80,100	24.5	43.3	Do.
3933	Tube No. 71...	do	47,000	86,850	20.0	30.7	Granulation radiating from dull spot.
3845	Tube No. 73...	do	45,000	84,900	25.0	51.9	Silky.
3825	Gas check	do	73,000	130,850	14.5	30.7	Granular, 55 per cent.; silky, 45 per cent.
3937	do	do	74,000	132,100	14.0	30.7	Granular, silky center.
3938	do	do	78,000	133,850	14.5	30.7	Granular, silky spot.
3819	Gas check No. 12.	do	74,000	129,300	14.0	34.0	Silky, 40 per cent.; granular, 60 per cent.
3870	Gas check No. 51.	do	80,000	139,900	18.5	20.5	Granular, with dull spot.
3878	do	do	77,000	136,400	14.0	23.9	Do.
3820	Gas check No. 70.	do	70,000	129,050	14.5	27.4	Granular, silky center.

\* Below.

## 3.6-INCH B. L. RIFLES.

## 3.6-INCH B. L. RIFLE.

## SPECIMENS FROM KEY RING.

No. 3818.

Marks, <sup>3.6 R, K R</sup><sub>T, M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
7,500	30,000	.000900	.000600	.....	.....	
10,000	50,000	.001700	.000800	.....	.....	
12,100	60,000	.005750	.004650	.003500	.003500	
12,200	61,000	.006500	.000750	.....	.....	
12,400	62,000	.007400	.000900	.....	.....	
12,600	63,000	.008400	.001000	.....	.....	
12,800	64,000	.009200	.000800	.....	.....	
13,200	66,000	.010900	.001700	.....	.....	
13,600	68,000	.012300	.001400	.....	.....	
14,000	70,000	.014300	.002000	.....	.....	
14,400	72,000	.015850	.001550	.....	.....	Tensile strength.
20,620	103,100	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 103,100  
 Elongation per inch after rupture ..... inch.. 0.235  
 Reduction in diameter at point of rupture ..... do .. .125  
 Reduction in area after rupture, per centum of original section ..... 43.3  
 Position of rupture ..... ".85 from neck  
 Character of broken surface ..... fine, silky  
 Elongation of inch sections ..... ".15, ".32\*

---

# 8-INCH STEEL B. L. RIFLES.

---

SPECIMENS FROM TUBES AND JACKETS.

---





## No. 891.

Marks,  $\frac{8 R, T}{B, T, I}$ 

Length, 5''.

Diameter, 1''.0092.

Sectional area, .80 square inch.

Gauged length, 3''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
800	1,000	0.	0.	0.	0.	Initial load.
4,000	5,000	.000100	.000100	.....	.....	
8,000	10,000	.000287	.000167	.....	.....	
12,000	15,000	.000400	.000133	.....	.....	
16,000	20,000	.000567	.000167	0.	.....	
20,000	25,000	.000767	.000200	.....	.....	
24,000	30,000	.000900	.000133	.....	.....	
28,000	35,000	.001100	.000200	.....	.....	
31,200	39,000	.001267	.000167	.....	.....	
32,000	40,000	.002600	.001333	.001367	.001367	Elastic limit.
32,800	41,000	.004400	.00 800	.....	.....	
33,600	42,000	.005000	.000600	.....	.....	
34,400	43,000	.005967	.000967	.....	.....	
35,200	44,000	.006800	.000633	.....	.....	
36,800	46,000	.008233	.001633	.....	.....	
38,400	48,000	.009933	.001700	.....	.....	
40,000	50,000	.011833	.001900	.....	.....	
68,780	85,975	.....	.....	.....	.....	
						Ultimate strength.

Failed by triple flexure.

No. 889.

Marks,  $\frac{8}{B} \frac{R_2}{T_2} \frac{J}{O}$ 

Length, 5'.

Diameter, 1".0092.

Sectional area, .80 square inch.

Gauged length, 3'.

Applied loads.		Compres- sion per inch.	Successive compres- sion per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
800	1,000	0.	0.	0.	0.	Initial load.
4,000	5,000	.000067	.000067	.....	.....	
8,000	10,000	.000233	.000166	.....	.....	
12,000	15,000	.000367	.000134	.....	.....	
16,000	20,000	.000500	.000133	0.	.....	
20,000	25,000	.000687	.000167	.....	.....	
24,000	30,000	.000833	.000166	.....	.....	
28,000	35,000	.001000	.000167	.....	.....	
32,000	40,000	.001100	.000100	0.	.....	
36,000	45,000	.001267	.000167	.....	.....	
40,000	50,000	.001500	.000233	.....	.....	Elastic limit.
44,000	55,000	.001667	.000167	.....	.....	
44,800	56,000	.001933	.000266	.....	.....	
45,600	57,000	.002667	.000734	.....	.....	
46,400	58,000	.003167	.000500	.....	.....	
47,200	59,000	.003833	.000666	.....	.....	
48,000	60,000	.004800	.000967	.....	.....	
49,600	62,000	.006167	.001367	.....	.....	
51,200	64,000	.007667	.001500	.....	.....	
52,800	66,000	.008967	.001300	.....	.....	
54,400	68,000	.010400	.001433	.....	.....	Ultimate strength.
56,000	70,000	.011833	.001433	.....	.....	
86,460	108,075	.....	.....	.....	.....	

Failed by triple flexure.

No. 888.

Marks,  $\frac{8}{B} \frac{R}{T} \frac{4}{M}$ 

Length, 5'".

Diameter, 1".0092.

Sectional area, .80 square inch.

Gauged length, 3'".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
800	1,000	0.	0.	0.	0.	Initial load.
4,000	5,000	.000133	.000133	.....	.....	
8,000	10,000	.000267	.000134	.....	.....	
12,000	15,000	.000400	.000133	.....	.....	
16,000	20,000	.000567	.000167	.000033	.000033	
20,000	25,000	.000733	.000166	.....	.....	
24,000	30,000	.000900	.000167	.....	.....	
28,000	35,000	.001067	.000167	.....	.....	
32,000	40,000	.001233	.000166	.000067	.000034	
36,000	45,000	.001367	.000134	.....	.....	Elastic limit.
36,800	46,000	.001433	.000066	.....	.....	
37,600	47,000	.001600	.000167	.....	.....	
38,400	48,000	.003767	.002167	.....	.....	
39,200	49,000	.004600	.000833	.....	.....	
40,000	50,000	.005100	.000500	.....	.....	
41,600	52,000	.006433	.001333	.....	.....	
43,200	54,000	.008000	.001567	.....	.....	
44,800	56,000	.009400	.001400	.....	.....	
46,400	58,000	.011033	.001633	.....	.....	
48,000	60,000	.015167	.004134	.....	.....	Ultimate strength.
76,250	95,310	.....	.....	.....	.....	

Failed by triple flexure.

No. 892.

Marks,  $\frac{8}{B} \frac{R_4}{T_5} \frac{J}{M}$ 

Length 5".

Diameter, 1".0092.

Sectional area, .80 square inch.

Gauged length, 3".

Applied loads		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
800	1,000	0.	0.	0.	0.	Initial load.
4,000	5,000	.000100	.000100	.....	.....	
8,000	10,000	.000233	.000133	.....	.....	
12,000	15,000	.000400	.000167	.....	.....	
16,000	20,000	.000533	.000133	0.	.....	
20,000	25,000	.000667	.000134	.....	.....	
24,000	30,000	.000833	.000166	.....	.....	
28,000	35,000	.001000	.000167	.....	.....	
32,000	40,000	.001167	.000167	0.	.....	
36,000	45,000	.001333	.000166	.....	.....	Elastic limit.
40,000	50,000	.001500	.000167	.....	.....	
40,800	51,000	.001600	.000100	.....	.....	
41,600	52,000	.001667	.000067	.....	.....	
42,400	53,000	.001833	.000166	.....	.....	
43,200	54,000	.002100	.000267	.....	.....	
44,000	55,000	.002567	.000467	.....	.....	
44,800	56,000	.002967	.000400	.....	.....	
46,400	58,000	.004233	.001266	.....	.....	
48,000	60,000	.006000	.001767	.....	.....	Ultimate strength.
84,600	105,750	.....	.....	.....	.....	

Failed by triple flexure.

No. 4259.

Marks,  $\frac{8}{R_0} J$   
 $\frac{MT_4}{M}$ Diameter,  $\frac{1}{2}$  .564.

Sectional area, .25 square inch.

Gauged, length 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000600	.000300	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
10,000	40,000	.001267	.000334	0.	.....	
11,000	44,000	.001433	.000166	0.	.....	
11,250	45,000	.001433	0.	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	
12,000	48,000	.001567	.000067	.....	.....	
12,250	49,000	.001600	.000033	.....	.....	Elastic limit.
12,500	50,000	.001633	.000033	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.008700	.006967	.....	.....	
13,750	55,000	.009267	.000567	.....	.....	
14,000	56,000	.009933	.000666	.....	.....	
14,500	58,000	.011600	.001667	.....	.....	
15,000	60,000	.013233	.001633	.....	.....	
15,500	62,010	.015000	.001767	.....	.....	
16,000	64,000	.017233	.002233	.....	.....	Tensile strength.
16,500	66,000	.019000	.001767	.....	.....	
23,670	94,680	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 94,680  
 Elastic limit per square inch of original section.....do... 53,000  
 Elongation per inch after rupture.....inch..... .2100  
 Elongation per inch under strain at elastic limit.....do... .001733  
 Reduction in diameter at point of rupture.....do... .134  
 Reduction in area after rupture, per centum of original section..... 41.9  
 Position of rupture.....1" 60 from neck  
 Character of broken surface.....silky  
 Elongation of inch sections....." 19, 24, \* " 10

No. 4260.

Marks,  $\frac{8}{B} \frac{R}{T} \frac{J}{M}$ 

Diameter, ' .564.

Sectional area, .25 square inch.

Gauged length, 3'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
10,000	40,000	.001333	.000366	0.	.....	
11,000	44,000	.001467	.000134	0.	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	Elastic limit.
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.001566	.....	.....	
13,000	52,000	.008700	.006967	.....	.....	
13,250	53,000	.009367	.006967	.....	.....	
13,500	54,000	.010167	.006800	.....	.....	
14,000	56,000	.011733	.001566	.....	.....	
14,500	58,000	.013500	.001767	.....	.....	
15,000	60,000	.015167	.001667	.....	.....	
15,500	62,000	.017133	.001966	.....	.....	Tensile strength.
16,000	64,000	.019167	.002034	.....	.....	
23,210	92,840	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 92,840  
 Elastic limit per square inch of original section ..... do .. 51,000  
 Elongation per inch after rupture ..... inch.. .2000  
 Elongation per inch under strain at elastic limit ..... do... .001733  
 Reduction in diameter at point of rupture ..... do... .134  
 Reduction in area after rupture, per centum of original section ..... 41.9  
 Position of rupture ..... ' .45 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... " .13, "30, \* " .17

No. 890.

Marks,  $8 R_5 J$   
 $8 B T_5 M$ Length,  $5'$ .Diameter,  $1''.0092$ .

Sectional area, .80 square inch.

Gauged length,  $3'$ .

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
800	1,000	0.	0.	0.	0.	Initial load.
4,000	5,000	.000067	.000067	.....	.....	
8,000	10,000	.000233	.000166	.....	.....	
12,000	15,000	.000367	.000134	.....	.....	
16,000	20,000	.000533	.000166	0.	.....	
20,000	25,000	.000700	.000167	.....	.....	
24,000	30,000	.000867	.000167	.....	.....	
28,000	35,000	.001033	.000166	.....	.....	
32,000	40,000	.001167	.000134	.000033	.000033	
36,000	45,000	.001333	.000166	.....	.....	
40,000	50,000	.001533	.000200	.....	.....	Elastic limit.
40,800	51,000	.001600	.000067	.....	.....	
41,600	52,000	.005333	.003733	.....	.....	
42,400	53,000	.006100	.000767	.....	.....	
43,200	54,000	.006767	.000667	.....	.....	
44,000	55,000	.007267	.000500	.....	.....	
44,800	56,000	.008067	.000800	.....	.....	
46,400	58,000	.009267	.001200	.....	.....	
48,000	60,000	.010767	.001500	.....	.....	
82,260	102,825	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## HARDNESS AND SPECIFIC GRAVITY.

Marks.	Hardness.	Specific gravity.
$8 R_2 A_4 M R_{10} M$ .....	21.64	7.8573
$8 R_2 I' B R_2 M$ .....	15.20	7.8639
$8 R_2 J B R_{10} M$ .....	20.03	7.8572
$8 R_2 A_4 M R_1 M$ .....	20.47	7.8536
$8 R_4 T B R_8 M$ .....	18.38	7.8598
$8 R_4 J B R_8 M$ .....	20.70	7.8560
$8 R_4 D_1 R_4 M$ .....	22.64	7.8496
$8 R_2 A_4 M R_1 M$ .....	21.40	7.8494
$8 R_2 J B_4 R_1 M$ .....	17.99	7.8625





---

## 10-INCH WIRE-WOUND RIFLE.

---

SPECIMENS FROM TUBE, JACKET, AND HOOPS.

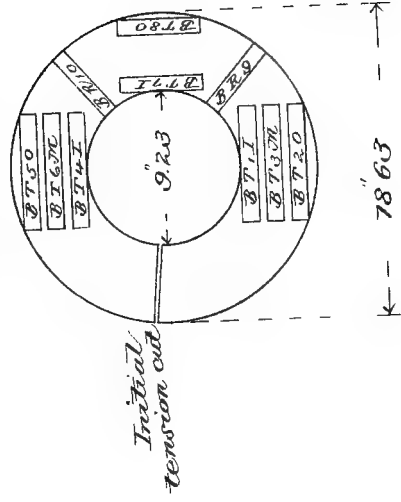
---



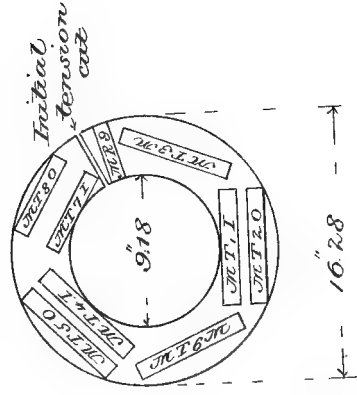


# 10-inch Wire Wound Rifle Tube

Breech end



Muzzle end



No. 3958.

Marks, <sup>10 W R T</sup>  
<sup>B T, I</sup>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000050	.000050	.....	.....	
2,500	10,000	.000225	.000175	.....	.....	
5,000	20,000	.000675	.000450	.....	.....	
7,500	30,000	.001025	.000850	.....	.....	
8,750	35,000	.001225	.000200	.000050	.000050	Elastic limit.
9,000	36,000	.001250	.000025	.....	.....	
9,280	37,000	.001275	.000050	.....	.....	
9,500	38,000	.001300	.000025	.....	.....	
9,750	39,000	.001425	.000125	.....	.....	
10,000	40,000	.001525	.000100	.000175	.000125	
10,250	41,000	.001650	.000125	.....	.....	
10,500	42,000	.002200	.000550	.....	.....	
10,750	43,000	.002875	.000675	.....	.....	
11,000	44,000	.003525	.000650	.....	.....	
11,500	46,000	.004675	.001150	.....	.....	
12,000	48,000	.006250	.001575	.....	.....	
12,500	50,000	.008175	.001925	.....	.....	
13,000	52,000	.010000	.001825	.....	.....	
13,500	54,000	.012000	.002000	.....	.....	
14,000	56,000	.014250	.002250	.....	.....	
14,500	58,000	.016375	.002125	.....	.....	
15,000	60,000	.018700	.002325	.....	.....	
15,500	62,000	.021125	.002425	.....	.....	
16,000	64,000	.023900	.002775	.....	.....	
16,500	66,000	.027000	.003100	.....	.....	
17,000	68,000	.030250	.003250	.....	.....	
17,500	70,000	.033450	.003200	.....	.....	
18,000	72,000	.038000	.004550	.....	.....	
18,500	74,000	.0425	.0045	.....	.....	
19,000	76,000	.0475	.0050	.....	.....	
19,500	78,000	.0538	.0063	.....	.....	
20,000	80,000	.0650	.0112	.....	.....	
20,500	82,000	.0750	.0100	.....	.....	
21,000	84,000	.0925	.0175	.....	.....	
21,420	85,680	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	85,680
Elastic limit per square inch of original section .....	do...	38,000
Elongation per inch after rupture .....	inch.	.2050
Elongation per inch under strain at elastic limit .....	do...	.001300
Reduction in diameter at point of rupture .....	do...	.154
Reduction in area after rupture, per centum of original section .....		47.2
Position of rupture .....	1" from neck	
Character of broken surface .....	silky	
Elongation of inch sections .....	"13, "14, "20, ".35*	

No. 3959.

Marks, <sup>10</sup>WRT  
BT<sub>2</sub>ODiameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	.....	.....	Elastic limit.
2,500	10,000	.000275	.000150	.....	.....	
5,000	20,000	.000675	.000400	.....	.....	
7,500	30,000	.001000	.000325	.....	.....	
8,750	35,000	.001225	.000225	0.	.....	
9,000	36,000	.001250	.000025	.....	.....	
9,250	37,000	.001275	.000025	.....	.....	
9,500	38,000	.001325	.000050	.....	.....	
9,750	39,000	.001375	.000050	.....	.....	
10,000	40,000	.001425	.000050	0.	.....	
10,250	41,000	.001450	.000025	.....	.....	
10,500	42,000	.001475	.000025	.....	.....	
10,750	43,000	.001500	.000025	.....	.....	
11,000	44,000	.001550	.000050	.....	.....	
11,250	45,000	.001575	.000025	.....	.....	
11,500	46,000	.001650	.000075	.....	.....	
11,750	47,000	.001700	.000050	.....	.....	
12,000	48,000	.001775	.000075	.....	.....	
12,250	49,000	.004500	.002725	.....	.....	
12,500	50,000	.007000	.002500	.....	.....	
12,750	51,000	.007450	.000450	.....	.....	Tensile strength.
13,000	52,000	.008375	.000625	.....	.....	
13,500	54,000	.010000	.001625	.....	.....	
14,000	56,000	.011875	.001875	.....	.....	
14,500	58,000	.013875	.002000	.....	.....	
15,000	60,000	.015925	.002050	.....	.....	
15,500	62,000	.018000	.002075	.....	.....	
16,000	64,000	.020425	.002425	.....	.....	
16,500	66,000	.023000	.002575	.....	.....	
17,000	68,000	.025500	.002500	.....	.....	
17,500	70,000	.028500	.003000	.....	.....	
18,000	72,000	.031625	.003125	.....	.....	
18,500	74,000	.035000	.003375	.....	.....	
19,000	76,000	.039000	.004000	.....	.....	
19,500	78,000	.043500	.004500	.....	.....	
20,000	80,000	.049125	.005625	.....	.....	
20,500	82,000	.053750	.004625	.....	.....	
21,000	84,000	.0650	.011250	.....	.....	
21,500	86,000	.0750	.0100	.....	.....	
22,000	88,000	.0950	.0200	.....	.....	
22,460	89,840	.1475	.0525	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 89,840  
 Elastic limit per square inch of original section.....do... 48,000  
 Elongation per inch after rupture.....inch... .2100  
 Elongation per inch under strain at elastic limit.....do... .001775  
 Reduction in diameter at point of rupture.....do... .164  
 Reduction in area after rupture, per centum of original section.....do... 49.7  
 Position of rupture.....1". 85 from neck  
 Character of broken surface.....silky  
 Elongation of inch sections.....", 13, "41, "17, "13

No. 3960.

Marks, <sup>10 W R T</sup>  
<sub>B T, M</sub>Diameter,  $\frac{7}{16}$  564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	.....	.....	
2,500	10,000	.000300	.000175	.....	.....	
5,000	20,000	.000675	.000375	.....	.....	
7,500	30,000	.001000	.000325	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
9,000	36,000	.001250	.000050	.....	.....	
9,250	37,000	.001275	.000025	.....	.....	
9,500	38,000	.001300	.000025	.....	.....	Elastic limit.
9,750	39,000	.001425	.000125	.....	.....	
10,000	40,000	.001550	.000125	.000275	.000275	
10,250	41,000	.002675	.001125	.....	.....	
10,500	42,000	.003500	.000825	.....	.....	
10,750	43,000	.004325	.000825	.....	.....	
11,000	44,000	.005175	.000850	.....	.....	
11,250	45,000	.005925	.000750	.....	.....	
11,500	46,000	.006950	.001025	.....	.....	
12,000	48,000	.008675	.001725	.....	.....	
12,500	50,000	.011000	.002325	.....	.....	
13,000	52,000	.013125	.002125	.....	.....	
13,500	54,000	.015500	.002375	.....	.....	
14,000	56,000	.017500	.002000	.....	.....	
14,500	58,000	.020000	.002500	.....	.....	
15,000	60,000	.022750	.002750	.....	.....	
15,500	62,000	.025750	.003000	.....	.....	
16,000	64,000	.028700	.002950	.....	.....	
16,500	66,000	.032500	.003800	.....	.....	
17,000	68,000	.036500	.004000	.....	.....	
17,500	70,000	.041250	.004750	.....	.....	
18,000	72,000	.046875	.005625	.....	.....	
18,500	74,000	.053250	.006375	.....	.....	
19,000	76,000	.0650	.011750	.....	.....	
19,500	78,000	.0750	.0100	.....	.....	
20,000	80,000	.0925	.0175	.....	.....	
20,500	82,000	.1325	.0400	.....	.....	
20,510	82,040	.1550	.0225	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 82,040  
 Elastic limit per square inch of original section ..... do... 38,000  
 Elongation per inch after rupture ..... inch... .2225  
 Elongation per inch under strain at elastic limit ..... do... .001300  
 Reduction in diameter at point of rupture ..... do... .164  
 Reduction in area after rupture, per centum of original section ..... 49.7  
 Position of rupture ..... 2" 40 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".14, ".33, ".30", ".12

H. Ex. 165—5

No. 3961.

Marks, <sup>10</sup> W R T  
<sub>B T<sub>4</sub> I</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Persquare inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000275	.000150	.....	.....	
5,000	20,000	.000675	.000400	.....	.....	
7,000	30,000	.001025	.000350	.....	.....	
8,750	35,000	.001250	.000225	.000025	.000025	
9,000	36,000	.001275	.000025	.....	.....	
9,250	37,000	.001300	.000025	.....	.....	Elastic limit.
9,500	38,000	.001425	.000125	.....	.....	
9,750	39,000	.001500	.000075	.....	.....	
10,000	40,000	.001700	.000200	.000350	.000325	
10,250	41,000	.001900	.000200	.....	.....	
10,500	42,000	.002250	.000350	.....	.....	
10,750	43,000	.002800	.000550	.....	.....	
11,000	44,000	.003625	.000825	.....	.....	
11,250	45,000	.004100	.000475	.....	.....	
11,500	46,000	.004750	.000650	.....	.....	
12,000	48,000	.006625	.001875	.....	.....	
12,500	50,000	.008500	.001875	.....	.....	
13,000	52,000	.010625	.00125	.....	.....	
13,500	54,000	.012500	.001875	.....	.....	
14,000	56,000	.014500	.002000	.....	.....	
14,500	58,000	.016700	.002200	.....	.....	
15,000	60,000	.019200	.002500	.....	.....	
15,500	62,000	.021750	.002550	.....	.....	
16,000	64,000	.024625	.002875	.....	.....	
16,500	66,000	.027750	.003125	.....	.....	
17,000	68,000	.031250	.003500	.....	.....	
17,500	70,000	.035000	.003750	.....	.....	
18,000	72,000	.039125	.004125	.....	.....	
18,500	74,000	.043750	.004625	.....	.....	
19,000	76,000	.0500	.006250	.....	.....	
19,500	78,000	.0575	.0075	.....	.....	
20,000	80,000	.0675	.0100	.....	.....	
20,500	82,000	.0800	.0125	.....	.....	
21,000	84,000	.1050	.0250	.....	.....	
21,160	84,640	.1500	.0540	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	84,640
Elastic limit per square inch of original section .....	do...	37,000
Elongation per inch after rupture .....	inch..	.1925
Elongation per inch under strain at elastic limit .....	do...	.001300
Reduction in diameter at point of rupture .....	do...	.154
Reduction in area after rupture, per centum of original section .....	.....	47.2
Position of rupture .....	".50 from neck	
Character of broken surface .....	silky	
Elongation of inch sections .....	".37", ".15", ".13", ".12	



No. 3962.

Marks, <sup>10 WBT</sup>  
<sup>B T O</sup>  
 Diameter, ".564.  
 Sectional area, .25 square inch.  
 Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125			
2,500	10,000	.000300	.000175			
5,000	20,000	.000700	.000400			
7,500	30,000	.001025	.000325			
8,750	35,000	.001200	.000175	0.		
9,000	36,000	.001225	.000025			
9,250	37,000	.001250	.000025			
9,500	38,000	.001275	.000025			
9,750	39,000	.001300	.000025			Elastic limit.
10,000	40,000	.001350	.000050	.000025	.000025	
10,250	41,000	.001400	.000050			
10,500	42,000	.001450	.000050			
10,750	43,000	.001500	.000050			
11,000	44,000	.001525	.000025			
11,250	45,000	.001550	.000025			
11,500	46,000	.001700	.000150			
11,750	47,000	.005125	.003425			
12,000	48,000	.007625	.002500			
12,250	49,000	.008250	.000625			Tensile strength.
12,500	50,000	.009125	.000875			
13,000	52,000	.011000	.001875			
13,500	54,000	.012925	.001925			
14,000	56,000	.015175	.002250			
14,500	58,000	.017125	.001950			
15,000	60,000	.019625	.002500			
15,500	62,000	.022175	.002550			
16,000	64,000	.024750	.002575			
16,500	66,000	.027625	.002875			
17,000	68,000	.030650	.003025			
17,500	70,000	.034000	.003350			
18,000	72,000	.038500	.004500			
18,500	74,000	.043000	.004500			
19,000	76,000	.048625	.005625			
19,500	78,000	.0550	.006375			
20,000	80,000	.0650	.0100			
20,500	82,000	.0750	.0100			
21,000	84,000	.0975	.0225			
21,480	85,920	.1475	.0500			

## General summary.

Tensile strength per square inch of original section ..... pounds.. 85,920  
 Elastic limit per square inch of original section ..... do... 45,000  
 Elongation per inch after rupture ..... inch... .2025  
 Elongation per inch under strain at elastic limit ..... do... .001550  
 Reduction in diameter at point of rupture ..... do... .174  
 Reduction in area after rupture, per centum of original section ..... 52.2  
 Position of rupture ..... 1' from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".40", ".18", ".13", ".10

No. 3913.

Marks, <sup>10 W R T</sup><sub>B T M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, ".4

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000175	.000175	0.	0.	
2,500	10,000	.000350	.000175			
5,000	20,000	.000675	.000325			
7,500	30,000	.001100	.000425			
8,750	35,000	.001250	.000150	.000050	.000050	Elastic limit.
9,000	36,000	.001300	.000050			
9,250	37,000	.001350	.000050			
9,500	38,000	.001425	.000075			
9,750	39,000	.001650	.000225			
10,000	40,000	.002075	.000425	.000775	.000725	
10,250	41,000	.002750	.000675			
10,500	42,000	.003890	.001050			
10,750	43,000	.004750	.000950			
11,000	44,000	.005700	.000950			
11,250	45,000	.006500	.000800			
11,500	46,000	.007400	.000900			
12,000	48,000	.009250	.001850			
12,500	50,000	.011625	.002375			
13,000	52,000	.013500	.001875			
13,500	54,000	.015700	.002200			
14,000	56,000	.017925	.002225			
14,500	58,000	.020650	.002725			
15,000	60,000	.023500	.002850			
15,500	62,000	.026575	.003075			
16,000	64,000	.029950	.003375			
16,500	66,000	.033500	.003550			
17,000	68,000	.037925	.004425			
17,500	70,000	.042625	.004700			
18,000	72,000	.048250	.005625			
18,500	74,000	.0550	.006750			
19,000	76,000	.0675	.0125			
19,500	78,000	.0750	.0075			
20,000	80,000	.0975	.0225			
20,480	81,920	.1550	.0575			Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	81,920
Elastic limit per square inch of original section.....	do.	37,000
Elongation per inch after rupture.....	inch....	.2100
Elongation per inch under strain at elastic limit.....	do.	.001350
Reduction in diameter at point of rupture.....	do.	.164
Reduction in area after rupture, per centum of original section.....		49.7
Position of rupture.....		"1 from neck
Character of broken surface.....		silky
Elongation of inch sections.....	"13, "14, "20, "37	

No. 3964.

Marks, <sup>10 W R T</sup>  
<sup>M T, I</sup>

Diameter ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000250	.000150	.....	.....	
5,000	20,000	.000650	.000400	.....	.....	
7,500	30,000	.001000	.000350	.....	.....	
8,750	35,000	.001175	.001175	0.	.....	
10,000	40,000	.001325	.000150	0.	.....	
10,250	41,000	.001375	.000050	0.	.....	
10,500	42,000	.001425	.000050	.....	.....	
10,750	43,000	.001475	.000050	.....	.....	
11,000	44,000	.001500	.000025	.....	.....	Elastic limit.
11,250	45,000	.001550	.000050	.....	.....	
11,500	46,000	.001725	.000175	.....	.....	
11,750	47,000	.002375	.000650	.....	.....	
12,000	48,000	.003500	.001125	.....	.....	
12,250	49,000	.004700	.001200	.....	.....	
12,500	50,000	.006020	.001350	.....	.....	
13,000	52,000	.007450	.001400	.....	.....	
13,500	54,000	.009325	.001875	.....	.....	
14,000	56,000	.011200	.001875	.....	.....	
14,500	58,000	.013000	.001800	.....	.....	
15,000	60,000	.014750	.001750	.....	.....	
15,500	62,000	.016625	.001875	.....	.....	
16,000	64,000	.018700	.002075	.....	.....	
16,500	66,000	.020775	.002075	.....	.....	
17,000	68,000	.023000	.002225	.....	.....	
17,500	70,000	.025750	.002750	.....	.....	
18,000	72,000	.028500	.002750	.....	.....	
18,500	74,000	.031025	.003125	.....	.....	
19,000	76,000	.034250	.002625	.....	.....	
19,500	78,000	.038500	.004250	.....	.....	
20,000	80,000	.0425	.0010	.....	.....	Tensile strength.
20,500	82,000	.0475	.0050	.....	.....	
21,000	84,000	.0550	.0075	.....	.....	
21,500	86,000	.0650	.0100	.....	.....	
22,000	88,000	.0750	.0100	.....	.....	
22,490	89,960	.1025	.0275	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 89,960  
 Elastic limit per square inch of original section.....do... 45,000  
 Elongation per inch after rupture.....inch... .1275  
 Elongation per inch under strain at elastic limit.....do... .001550  
 Reduction in diameter at point of rupture.....do... .114  
 Reduction in area after rupture, per centum of original section.....do... 36.4  
 Position of rupture.....".60 from neck  
 Character of broken surface.....silky oblique, slightly granular at one part of the circumference  
 Elongation of inch sections.....".08, ".07, ".08, ".28"

No. 3965.

Marks, <sup>10 W R T</sup><sub>M T<sub>2</sub> O</sub>Diameter <sup>11</sup>/.564.

Sectional area, .25 square inch.

Gauged length 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000350	.000200	.....	.....	
5,000	20,000	.000725	.000375	.....	.....	
7,500	30,000	.001025	.000300	.....	.....	
8,750	35,000	.001225	.000200	0.	.....	
10,000	40,000	.000375	.000150	0.	.....	
10,250	41,000	.001400	.000025	.....	.....	
10,500	42,000	.001425	.000025	.....	.....	
10,750	43,000	.001475	.000050	.....	.....	
11,000	44,000	.001525	.000050	.....	.....	
11,250	45,000	.001550	.000025	.....	.....	
11,500	46,000	.001575	.000025	.....	.....	Elastic limit.
11,750	47,000	.001675	.000100	.....	.....	
12,000	48,000	.004250	.002575	.....	.....	
12,250	49,000	.005500	.001250	.....	.....	
12,500	50,000	.006750	.001250	.....	.....	
13,000	52,000	.008275	.001525	.....	.....	
13,500	54,000	.010125	.001850	.....	.....	
14,000	56,000	.011950	.001825	.....	.....	
14,500	58,000	.013775	.001825	.....	.....	
15,000	60,000	.015950	.002175	.....	.....	
15,500	62,000	.018250	.002300	.....	.....	
16,000	64,000	.020300	.002050	.....	.....	
16,500	66,000	.022875	.002575	.....	.....	
17,000	68,000	.025500	.002625	.....	.....	
17,500	70,000	.028375	.002875	.....	.....	
18,000	72,000	.031875	.003500	.....	.....	
18,500	74,000	.035500	.003625	.....	.....	
19,000	76,000	.039500	.004000	.....	.....	
19,500	78,000	.044000	.004500	.....	.....	
20,000	80,000	.049625	.005625	.....	.....	
20,500	82,000	.0550	.005375	.....	.....	
21,000	84,000	.0675	.0125	.....	.....	
21,500	86,000	.0800	.0125	.....	.....	
22,000	88,000	.1075	.0275	.....	.....	Tensile strength.
22,070	88,280	.1325	.0250	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds . 88,280  
 Elastic limit per square inch of original section.....do. . 46,000  
 Elongation per inch after rupture.....inch. . 2000  
 Elongation per inch under strain at elastic limit.....do. . 001575  
 Reduction in diameter at point of rupture.....do. . 174  
 Reduction in area after rupture, per centum of original section.....52.2  
 Position of rupture....."1.20 from neck  
 Character of broken surface.....silly  
 Elongation of inch sections.....".08, ".11, ".24, ".37"

No. 3966.

Marks, <sup>10</sup>W R T  
<sup>M T M</sup>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000275	.000150	0.	0.	
5,000	20,000	.000575	.000300	0.	0.	
7,500	30,000	.000975	.000400	0.	0.	
8,750	35,000	.001100	.000125	0.	0.	
10,000	40,000	.001275	.000175	0.	0.	
10,250	41,000	.001300	.000025	0.	0.	
10,500	42,000	.001325	.000025	0.	0.	
10,750	43,000	.001350	0.	0.	0.	
11,000	44,000	.001400	.000050	0.	0.	
11,250	45,000	.001475	.000075	0.	0.	
11,500	46,000	.001500	.000025	0.	0.	
11,750	47,000	.001525	.000025	0.	0.	Elastic limit.
12,000	48,000	.001675	.000050	0.	0.	
12,250	49,000	.004000	.002325	0.	0.	
12,500	50,000	.004950	.000950	0.	0.	
13,000	52,000	.007250	.002300	0.	0.	
13,500	54,000	.009500	.002250	0.	0.	
14,000	56,000	.010750	.001250	0.	0.	
14,500	58,000	.013700	.002950	0.	0.	
15,000	60,000	.014375	.000675	0.	0.	
15,500	62,000	.016250	.001875	0.	0.	
16,000	64,000	.018450	.002200	0.	0.	
16,500	66,000	.020625	.002175	0.	0.	
17,000	68,000	.023250	.002625	0.	0.	
17,500	70,000	.026000	.002750	0.	0.	
18,000	72,000	.028750	.002750	0.	0.	Tensile strength.
18,500	74,000	.031750	.003000	0.	0.	
19,000	76,000	.036550	.004800	0.	0.	
19,500	78,000	.039000	.002450	0.	0.	
20,000	80,000	.043750	.004750	0.	0.	
20,500	82,000	.049375	.005625	0.	0.	
21,000	84,000	.0550	.005625	0.	0.	
21,500	86,000	.0675	.0125	0.	0.	
22,000	88,000	.0800	.0125	0.	0.	
22,500	90,000	.1150	.0350	0.	0.	
22,610	90,440	.1425	.0275	0.	0.	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 90,440  
 Elastic limit per square inch of original section ..... do.. 47,000  
 Elongation per inch after rupture ..... inch.. .1650  
 Elongation per inch under strain at elastic limit ..... do.. .001525  
 Reduction in diameter at point of rupture ..... do.. .094  
 Reduction in area after rupture, per centum of original section ..... 30.6  
 Position of rupture ..... 1". 25 from neck  
 Character of broken surface ..... granular 60 per cent., silky oblique 40 per cent.  
 Elongation of inch sections ..... ". 20, ". 26\*, ". 11, ". 09

No. 3967.

Marks, <sup>10 W R T</sup><sub>M T, I</sub>Diameter, <sup>10 W R T</sup><sub>M T, I</sub> .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000275	.000150	0.	0.	
5,000	20,000	.000625	.000350	0.	0.	
7,500	30,000	.001000	.000375	0.	0.	
8,750	35,000	.001150	.000150	0.	0.	
10,000	40,000	.001275	.000125	0.	0.	
10,250	41,000	.001300	.000025	0.	0.	
10,500	42,000	.001325	.000025	0.	0.	
10,750	43,000	.001375	.000050	0.	0.	
11,000	44,000	.001425	.000050	0.	0.	
11,250	45,000	.001625	.000200	0.	0.	
11,500	46,000	.005250	.003625	0.	0.	
11,750	47,000	.005850	.000600	0.	0.	
12,000	48,000	.006275	.000425	0.	0.	
12,250	49,000	.006950	.000675	0.	0.	
12,500	50,000	.008075	.001125	0.	0.	
13,000	52,000	.010000	.001925	0.	0.	
13,500	54,000	.011875	.001875	0.	0.	
14,000	56,000	.013750	.001875	0.	0.	
14,500	58,000	.016000	.002250	0.	0.	
15,000	60,000	.018000	.002000	0.	0.	
15,500	62,000	.020375	.002375	0.	0.	
16,000	64,000	.022800	.002475	0.	0.	
16,500	66,000	.025500	.002700	0.	0.	
17,000	68,000	.028375	.002875	0.	0.	
17,500	70,000	.031250	.002875	0.	0.	
18,000	72,000	.034750	.003500	0.	0.	
18,500	74,000	.038500	.003750	0.	0.	
19,000	76,000	.043375	.004575	0.	0.	
19,500	78,000	.048375	.005000	0.	0.	
20,000	80,000	.0550	.006625	0.	0.	
20,500	82,000	.0675	.0125	0.	0.	
21,000	84,000	.0775	.0100	0.	0.	
21,500	86,000	.0950	.0175	0.	0.	
21,990	87,960	.1475	.0525	0.	0.	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	87,960
Elastic limit per square inch of original section .....	do..	44,000
Elongation per inch after rupture .....	inch..	.2000
Elongation per inch under strain at elastic limit .....	do..	.001425
Reduction in diameter at point of rupture .....	do..	.114
Reduction in area after rupture, per centum of original section .....	do..	36.4
Position of rupture .....	2" .20 from neck	
Character of broken surface .....	silky, oblique	
Elongation of inch sections .....	" 14, " .32, " .20, " .14	

No. 3968.

Marks, <sup>10 W R T</sup>  
<sub>M T<sub>5</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000275	.000150	.....	.....	
5,000	20,000	.000600	.000325	.....	.....	
7,500	30,000	.001000	.000400	.....	.....	
8,750	35,000	.001150	.000150	0.	.....	
10,000	40,000	.001275	.000125	0.	.....	
10,250	41,000	.001325	.000050	.....	.....	
10,500	42,000	.001375	.000050	.....	.....	
10,750	43,000	.001425	.000050	.....	.....	
11,000	44,000	.001475	.000050	.....	.....	Elastic limit.
11,250	45,000	.001500	.000025	.....	.....	
11,500	46,000	.001525	.000025	.....	.....	
11,750	47,000	.001750	.000025	.....	.....	
12,000	48,000	.001750	.000200	.....	.....	
12,250	49,000	.006250	.005000	.....	.....	
12,500	50,000	.008625	.001875	.....	.....	
13,000	52,000	.009650	.001025	.....	.....	
13,500	54,000	.011700	.002050	.....	.....	
14,000	56,000	.013700	.002000	.....	.....	Tensile strength.
14,500	58,000	.016000	.002300	.....	.....	
15,000	60,000	.018125	.002125	.....	.....	
15,500	62,000	.020500	.002375	.....	.....	
16,000	64,000	.023250	.002750	.....	.....	
16,500	66,000	.026000	.002750	.....	.....	
17,000	68,000	.029125	.003125	.....	.....	
17,500	70,000	.033000	.003875	.....	.....	
18,000	72,000	.038000	.003000	.....	.....	
18,500	74,000	.040500	.004500	.....	.....	
19,000	76,000	.045000	.004500	.....	.....	
19,500	78,000	.051250	.006250	.....	.....	
20,000	80,000	.0575	.006250	.....	.....	
20,500	82,000	.0700	.0125	.....	.....	
21,000	84,000	.0825	.0125	.....	.....	
21,500	86,000	.1075	.0250	.....	.....	
21,720	86,880	.1600	.0525	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	86,880
Elastic limit per square inch of original section .....	do.	47,000
Elongation per inch after rupture .....	inch.	.2150
Elongation per inch under strain at elastic limit .....	do.	.001550
Reduction in diameter at point of rupture .....	do.	.164
Reduction in area after rupture, per centum of original section .....		49.7
Position of rupture .....	2' from neck	
Character of broken surface .....	silky	
Elongation of inch sections .....	"13, "16, "42", "1	

No. 3969.

Marks, <sup>10 W R T.</sup>  
<sup>M T, M</sup>  
 Diameter, ".564.  
 Sectional area, .25 square inch.  
 Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	0.	0.	
5,000	20,000	.000675	.000375	0.	0.	
7,500	30,000	.001025	.000350	0.	0.	
8,750	35,000	.001200	.000175	0.	0.	
10,000	40,000	.001375	.000175	0.	0.	
10,250	41,000	.001425	.000050	0.	0.	
10,500	42,000	.001450	.000025	0.	0.	
10,750	43,000	.001475	.000025	0.	0.	
11,000	44,000	.001525	.000050	0.	0.	Elastic limit.
11,250	45,000	.001575	.000050	0.	0.	
11,500	46,000	.003500	.001925	0.	0.	
11,750	47,000	.005025	.001525	0.	0.	
12,000	48,000	.006000	.000975	0.	0.	
12,250	49,000	.006500	.000500	0.	0.	
12,500	50,000	.007675	.001175	0.	0.	
13,000	52,000	.009625	.001950	0.	0.	
13,500	54,000	.011625	.002000	0.	0.	
14,000	56,000	.013500	.001875	0.	0.	
14,500	58,000	.015500	.002000	0.	0.	Tensile strength.
15,000	60,000	.017800	.003300	0.	0.	
15,500	62,000	.020775	.002975	0.	0.	
16,000	64,000	.022750	.001975	0.	0.	
16,500	66,000	.025625	.002875	0.	0.	
17,000	68,000	.028750	.003125	0.	0.	
17,500	70,000	.031875	.003125	0.	0.	
18,000	72,000	.035025	.003750	0.	0.	
18,500	74,000	.039575	.003950	0.	0.	
19,000	76,000	.044500	.004925	0.	0.	
19,500	78,000	.051000	.006500	0.	0.	
20,000	80,000	.058250	.007250	0.	0.	
20,500	82,000	.0700	.011750	0.	0.	
21,000	84,000	.0825	.0125	0.	0.	
21,500	86,000	.1075	.0250	0.	0.	
21,700	86,800	.1450	.0375	0.	0.	

## General summary.

Tensile strength per square inch of original section ..... pounds. 86,800  
 Elastic limit per square inch of original section ..... do. 45,000  
 Elongation per inch after rupture ..... inch. .2175  
 Elongation per inch under strain at elastic limit ..... do. .001575  
 Reduction in diameter at point of rupture ..... do. .184  
 Reduction in area after rupture, per centum of original section ..... 54.6  
 Position of rupture ..... 2" from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".15, ".43, ".16, ".13



No. 814.

Marks, <sup>10 W R T.</sup>  
<sub>B T, I</sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000187	.000187	.....	.....	
5,000	10,000	.000333	.000186	.....	.....	
7,500	15,000	.000500	.000187	.....	.....	
10,000	20,000	.000667	.000187	0.	.....	
12,500	25,000	.000833	.000186	.....	.....	
15,000	30,000	.001000	.000187	.000067	.000067	
15,500	31,000	.001033	.000033	.....	.....	
16,000	32,000	.001067	.000034	.....	.....	
16,500	33,000	.001100	.000033	.....	.....	
17,000	34,000	.001133	.000033	.....	.....	
17,500	35,000	.001167	.000034	.000133	.000066	
18,000	36,000	.001200	.000033	.....	.....	
18,500	37,000	.001233	.000033	.....	.....	
19,000	38,000	.001300	.000067	.....	.....	
19,500	39,000	.001333	.000033	.....	.....	
20,000	40,000	.001400	.000077	.000300	.000187	Elastic limit.
20,500	41,000	.001500	.000100	.....	.....	
21,000	42,000	.001633	.000133	.....	.....	
21,500	43,000	.001787	.000134	.....	.....	
22,000	44,000	.003000	.001233	.....	.....	
22,500	45,000	.006000	.003000	.....	.....	
23,000	46,000	.006600	.006600	.....	.....	
23,500	47,000	.007000	.006400	.....	.....	
24,000	48,000	.007700	.006700	.....	.....	
24,500	49,000	.008500	.006800	.....	.....	
25,000	50,000	.009500	.001000	.....	.....	Ultimate strength.
38,050	76,100	.....	.....	.....	.....	

Failed by triple flexure.

No. 815.

Marks, <sup>10 W R T</sup>  
<sub>B T<sub>5</sub> O</sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compres- sion per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	.....	.....	
5,000	10,000	.000267	.000134	.....	.....	
7,500	15,000	.000433	.000166	.....	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	.....	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001100	.000167	.....	.....	
18,000	36,000	.001133	.000033	.....	.....	
18,500	37,000	.001167	.000034	.....	.....	
19,000	38,000	.001200	.000033	.....	.....	
19,500	39,000	.001233	.000033	.....	.....	
20,000	40,000	.001300	.000067	.000067	.000067	
20,500	41,000	.001367	.000067	.....	.....	
21,000	42,000	.001500	.000133	.....	.....	
21,500	43,000	.001600	.000100	.....	.....	Elastic limit.
22,000	44,000	.001700	.000100	.....	.....	
22,500	45,000	.001967	.000267	.....	.....	
23,000	46,000	.002500	.000533	.....	.....	
23,500	47,000	.003333	.000833	.....	.....	
24,000	48,000	.004500	.001167	.....	.....	
24,500	49,000	.005800	.001300	.....	.....	
25,000	50,000	.007233	.001433	.....	.....	
39,520	79,040	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 816.

Marks, <sup>10 W B T</sup>  
<sub>B B</sub>

Length, 4'.27.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,800	5,000	.000067	.000067	.....	.....	
5,000	10,000	.000233	.000166	.....	.....	
7,500	15,000	.000367	.000134	.....	.....	
10,000	20,000	.000533	.000166	0.	.....	
12,500	25,000	.000700	.000167	.....	.....	
15,000	30,000	.000867	.000167	0.	.....	
17,500	35,000	.001033	.000166	.....	.....	
18,000	36,000	.001033	0.	.....	.....	
18,500	37,000	.001067	.000034	.....	.....	
19,000	38,000	.001100	.000033	.....	.....	
19,500	39,000	.001133	.000033	.....	.....	
20,000	40,000	.001167	.000034	0.	.....	
20,500	41,000	.001200	.000033	.....	.....	Elastic limit.
21,000	42,000	.001333	.000133	.....	.....	
21,500	43,000	.001500	.000167	.....	.....	
22,000	44,000	.002867	.001367	.....	.....	
22,500	45,000	.003333	.000466	.....	.....	
23,000	46,000	.003900	.000567	.....	.....	
23,500	47,000	.004567	.000667	.....	.....	
24,000	48,000	.005200	.000633	.....	.....	
24,500	49,000	.005967	.000767	.....	.....	
25,000	50,000	.006767	.000800	.....	.....	
44,950	89,900	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 817.

Marks, <sup>10 W R T</sup>  
<sub>B R<sub>0</sub></sub>

Length, 4' .42.

Diameter, ' .798.

Sectional area, .50 square inch.

Gauged length, 3'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	.....	.....	
5,000	10,000	.000267	.000134	.....	.....	
7,500	15,000	.000433	.000166	.....	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	.....	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001133	.000200	.....	.....	
18,000	36,000	.001167	.000334	.....	.....	
18,500	37,000	.001200	.000333	.....	.....	
19,000	38,000	.001233	.000333	.....	.....	Elastic limit.
19,500	39,000	.001300	.000367	.....	.....	
20,000	40,000	.001433	.000133	.000200	.000200	
20,500	41,000	.001567	.000134	.....	.....	
21,000	42,000	.001733	.000166	.....	.....	
21,500	43,000	.002333	.000600	.....	.....	
22,000	44,000	.003600	.001267	.....	.....	
22,500	45,000	.004467	.000867	.....	.....	
23,000	46,000	.005067	.000600	.....	.....	
23,500	47,000	.005833	.000766	.....	.....	
24,000	48,000	.006567	.000734	.....	.....	Ultimate strength.
24,500	49,000	.007433	.000866	.....	.....	
25,000	50,000	.008467	.001034	.....	.....	
43,400	86,800	.....	.....	.....	.....	

Failed by triple flexure.

No. 818.

Marks, <sup>10 W R T</sup><sub>M T, I</sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
500	1,000	0.	0.	0.	0.	
2,500	5,000	.000133	.000133	.....	.....	
5,000	10,000	.000267	.000134	.....	.....	
7,500	15,000	.000433	.000166	.....	.....	
10,000	20,000	.000600	.000167	.....	.....	
12,500	25,000	.000767	.000167	.....	.....	
15,000	30,000	.000933	.000166	.000033	.000033	
17,500	35,000	.001100	.000167	.....	.....	
20,000	40,000	.001333	.000233	.000067	.000034	
20,500	41,000	.001367	.000034	.....	.....	
21,000	42,000	.001400	.000033	.....	.....	
21,500	43,000	.001433	.000033	.....	.....	
22,000	44,000	.001467	.000034	.....	.....	
22,500	45,000	.001500	.000033	.....	.....	Elastic limit.
23,000	46,000	.001567	.000067	.....	.....	
23,500	47,000	.001667	.000300	.....	.....	
24,000	48,000	.003400	.001533	.....	.....	
24,500	49,000	.006733	.003333	.....	.....	
25,000	50,000	.007100	.00367	.....	.....	
25,500	51,000	.007667	.00567	.....	.....	
26,000	52,000	.008500	.00833	.....	.....	
40,940	81,880	.....	.....	.....	.....	
						Ultimate strength.

Failed by triple flexure.

## No. 819.

Marks, <sup>10 W R T</sup><sub>M T 8 O</sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	.....	.....	
5,000	10,000	.000267	.000134	.....	.....	
7,500	15,000	.000433	.000166	.....	.....	
10,000	20,000	.000567	.000134	0.	.....	
12,500	25,000	.000733	.000166	.....	.....	
15,000	30,000	.000900	.000167	0.	.....	
17,500	35,000	.001033	.000133	.....	.....	
20,000	40,000	.001167	.000134	0.	.....	
20,500	41,000	.001200	.000033	.....	.....	
21,000	42,000	.001233	.000033	.....	.....	
21,500	43,000	.001233	0.	.....	.....	
22,000	44,000	.001267	.000034	.....	.....	
22,500	45,000	.001300	.000033	.....	.....	
23,000	46,000	.001333	.000033	.....	.....	
23,500	47,000	.001367	.000034	.....	.....	Elastic limit.
24,000	48,000	.001367	0.	.....	.....	
24,500	49,000	.003567	.002200	.....	.....	
25,000	50,000	.005667	.002100	.....	.....	
25,500	51,000	.006333	.000666	.....	.....	
26,000	52,000	.007100	.000767	.....	.....	Ultimate strength.
38,710	77,420	.....	.....	.....	.....	

Failed by triple flexure.

No. 820.

Marks, <sup>10 W R T</sup><sub>M R<sub>2</sub></sub>

Length, 3'' .42.

Diameter, '' .798.

Sectional area, .50 square inch.

Gauged length, 2''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1, 000	0.	0.	0.	0.	Initial load.
2, 500	5, 000	.000100	.000100	.....	.....	
5, 000	10, 000	.000200	.000100	.....	.....	
7, 500	15, 000	.000350	.000150	.....	.....	
10, 000	20, 000	.000550	.000200	0.	.....	
12, 500	25, 000	.000750	.000200	.....	.....	
15, 000	30, 000	.000950	.000200	0.	.....	
17, 500	35, 000	.001100	.000150	.....	.....	
20, 000	40, 000	.001250	.000150	0.	.....	
20, 500	41, 000	.001250	0.	.....	.....	
21, 000	42, 000	.001300	.000050	.....	.....	Elastic limit.
21, 500	43, 000	.001300	0.	.....	.....	
22, 000	44, 000	.001350	.000050	.....	.....	
22, 500	45, 000	.001400	.000050	.....	.....	
23, 000	46, 000	.002150	.000750	.....	.....	
23, 500	47, 000	.003500	.001350	.....	.....	
24, 000	48, 000	.004650	.001150	.....	.....	
24, 500	49, 000	.005850	.001000	.....	.....	
25, 000	50, 000	.006000	.000350	.....	.....	
25, 500	51, 000	.006650	.000650	.....	.....	
26, 000	52, 000	.007650	.001000	.....	.....	Ultimate strength.
51, 100	102, 200	.....	.....	.....	.....	

Failed by triple flexure.

H. Ex. 165—6

## 10-INCH WIRE-WOUND RIFLE.

## 10-INCH WIRE-WOUND RIFLE.

## JACKET.

No. 4217.

Marks, <sup>10 W R J</sup><sub>M T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000300	.000200			
3,750	15,000	.000500	.000200			
5,000	20,000	.000667	.000167	0.		
6,250	25,000	.000833	.000166			
7,500	30,000	.001033	.000200			
8,750	35,000	.001200	.000167			
10,000	40,000	.001367	.000167	.000067	.000067	
11,250	45,000	.001667	.000300			
12,500	50,000	.001933	.000266			
12,750	51,000	.001967	.000034			
13,000	52,000	.002067	.000100			
13,250	53,000	.002167	.000100			Elastic limit. Not well defined.
13,500	54,000	.002267	.000100			
13,750	55,000	.002400	.000133			
14,000	56,000	.002600	.000200			
14,250	57,000	.002767	.000167			
14,500	58,000	.003033	.000266			
14,750	59,000	.003267	.000234			
15,000	60,000	.003700	.000433			
15,500	62,000	.004600	.000900			
16,000	64,000	.005667	.001067			
16,500	66,000	.006967	.001300			
17,000	68,000	.008400	.001433			
17,500	70,000	.010000	.001600			
19,000	76,000	.0167	.0067			
20,000	80,000	.0267	.0100			
21,000	84,000	.0300	.0033			
23,940	87,760	-----	-----			Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	87,760
Elastic limit per square inch of original section (not well defined) .....	do...	52,000
Elongation per inch after rupture .....	inch..	.0367
Elongation per inch under strain at elastic limit .....	do...	.002067
Reduction in diameter at point of rupture .....		.014
Reduction in area after rupture, per centum of original section .....		5.0
Position of rupture .....	"	.35 from neck
Character of broken surface .....	granular, dark colored, spongy spot at circumference	
Elongation of inch sections .....	"	.06", ".03", ".02



No. 4218.

Marks, <sup>10 W R J</sup>  
<sup>M T<sub>3</sub> I</sup>Diameter, <sup>11</sup>564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	.....	.....	
3,750	15,000	.000500	.000200	.....	.....	
5,000	20,000	.000667	.000167	.....	.....	
6,250	25,000	.000833	.000166	.....	.....	
7,500	30,000	.001000	.000167	.....	.....	
8,750	35,000	.001167	.000167	.....	.....	
10,000	40,000	.001333	.000166	.000033	.000033	
11,250	45,000	.001567	.000234	.....	.....	
11,500	46,000	.001600	.000033	.....	.....	Elastic limit.
11,750	47,000	.001638	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001833	.000133	.....	.....	
12,750	51,000	.001933	.000100	.....	.....	
13,000	52,000	.002067	.000134	.....	.....	
13,250	53,000	.002233	.000166	.....	.....	
13,500	54,000	.002433	.000200	.....	.....	
13,750	55,000	.002833	.000400	.....	.....	
14,000	56,000	.003433	.000600	.....	.....	
14,250	57,000	.003833	.000400	.....	.....	
14,500	58,000	.004667	.000834	.....	.....	
14,750	59,000	.005267	.000600	.....	.....	
15,000	60,000	.006333	.001066	.....	.....	
15,500	62,000	.008267	.001934	.....	.....	
16,000	64,000	.010033	.001766	.....	.....	
16,500	66,000	.012033	.002000	.....	.....	
17,000	68,000	.014333	.002300	.....	.....	
17,500	70,000	.016900	.002567	.....	.....	
18,500	74,000	.0200	.0031	.....	.....	
20,000	80,000	.0300	.0100	.....	.....	
21,000	84,000	.0367	.0067	.....	.....	
22,000	88,000	.0533	.0166	.....	.....	
22,960	91,840	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 91,840  
 Elastic limit per square inch of original section ..... do... 49,000  
 Elongation per inch after rupture ..... inch... .0733  
 Elongation per inch under strain at elastic limit ..... do... .001700  
 Reduction in diameter at point of rupture ..... do... .054  
 Reduction in area after rupture, per centum of original section ..... 18.3  
 Position of rupture ..... ".15 from neck  
 Character of broken surface granular 50 per cent; dull silky with fine streak bright metal 50 per cent

No. 4219.

Marks, <sup>10 W R J</sup><sub>M T, M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250.	1,000	0.	0.	0.	.....	
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
3,750	15,000	.000500	.000167	.....	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000900	.000233	.....	.....	
7,500	30,000	.001067	.000167	.....	.....	
8,750	35,000	.001267	.000200	.....	.....	
10,000	40,000	.001400	.000133	.000033	.000033	
11,250	45,000	.001667	.000267	.....	.....	
11,500	46,000	.001700	.000033	.....	.....	
11,750	47,000	.001800	.000100	.....	.....	Elastic limit. Not well defined.
12,000	48,000	.001933	.000133	.....	.....	
12,250	49,000	.002033	.000100	.....	.....	
12,500	50,000	.002100	.000067	.....	.....	
12,750	51,000	.002267	.000167	.....	.....	
13,000	52,000	.002567	.000300	.....	.....	
13,250	53,000	.003667	.001100	.....	.....	
13,500	54,000	.005000	.001333	.....	.....	
14,000	56,000	.006700	.001700	.....	.....	
14,500	58,000	.008333	.001633	.....	.....	
15,000	60,000	.010400	.002067	.....	.....	
16,000	64,000	.0133	.0029	.....	.....	
17,000	68,000	.0233	.0100	.....	.....	
18,000	72,000	.0333	.0100	.....	.....	
18,680	74,720	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	74,720
Elastic limit per square inch of original section, not well defined .....	do...	46,000
Elongation per inch after rupture .....	inch..	.0300
Elongation per inch under strain at elastic limit .....	do...	.001700
Reduction in diameter at point of rupture .....	do...	.014
Reduction in area after rupture, per centum of original section .....		5.0
Position of rupture .....	1", 1 from neck	
Character of broken surface .....	granular, dark-colored spongy metal at one side of specimen	
Elongation of inch sections .....	".04", ".03", ".02	

No. 4220.

Marks, <sup>10 W R J</sup><sub>M T<sub>2</sub> M</sub>

Diameter, ".563.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000300	.000200	.....	.....	
3,750	15,000	.000500	.000200	.....	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	.....	.....	
7,500	30,000	.001033	.000200	.....	.....	
8,750	35,000	.001267	.000234	.....	.....	
10,000	40,000	.001500	.000233	.000133	.000133	
10,250	41,000	.001567	.000067	.....	.....	Elastic limit.
10,500	42,000	.001633	.000066	.....	.....	
10,750	43,000	.002000	.000367	.....	.....	
11,000	44,000	.002500	.000500	.....	.....	
11,250	45,000	.004000	.001500	.....	.....	
11,500	46,000	.007667	.003667	.....	.....	
11,750	47,000	.010400	.002733	.....	.....	
12,000	48,000	.011333	.000933	.....	.....	
12,250	49,000	.012667	.001334	.....	.....	
12,500	50,000	.014000	.001333	.....	.....	Tensile strength.
13,000	52,000	.016667	.002667	.....	.....	
13,500	54,000	.0200	.003333	.....	.....	
14,000	56,000	.0233	.0033	.....	.....	
14,500	58,000	.0267	.0034	.....	.....	
15,000	60,000	.0300	.0033	.....	.....	
15,500	62,000	.0333	.0033	.....	.....	
16,000	64,000	.0400	.0067	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 64,000  
 Elastic limit per square inch of original section.....do... 42,000  
 Elongation per inch after rupture.....inch... .0600  
 Elongation per inch under strain at elastic limit.....do... .001633  
 Reduction in diameter at point of rupture.....do... .043  
 Reduction in area after rupture, per centum of original section.....15.0  
 Position of rupture.....".3 from neck  
 Character of broken surface.....dull silky, band of dark colored spongy metal extends across surface  
 Elongation of inch sections.....".04, ".04, ".10"

No. 4221.

Marks, <sup>10 W R J</sup><sub>M T A I</sub>Diameter, <sup>11</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000267	.000167	0.	0.	
3,750	15,000	.000433	.000166	0.	0.	
5,000	20,000	.000567	.000134	0.	0.	
6,250	25,000	.000733	.000166	0.	0.	
7,500	30,000	.000933	.000200	0.	0.	
8,750	35,000	.001067	.000134	0.	0.	
10,000	40,000	.001267	.000200	0.	0.	
11,250	45,000	.001400	.000133	0.	0.	
12,000	48,000	.001600	.000200	0.	0.	
12,250	49,000	.001633	.000033	0.	0.	
12,500	50,000	.001700	.000067	0.	0.	
12,750	51,000	.001733	.000033	0.	0.	
13,000	52,000	.001867	.000134	0.	0.	Elastic limit.
13,250	53,000	.002000	.000133	0.	0.	
13,500	54,000	.002167	.000167	0.	0.	
13,750	55,000	.002500	.000333	0.	0.	
14,000	56,000	.003667	.001167	0.	0.	
14,500	58,000	.006033	.002366	0.	0.	
15,000	60,000	.007933	.001900	0.	0.	
15,500	62,000	.010000	.002067	0.	0.	
16,000	64,000	.011667	.001667	0.	0.	
16,500	66,000	.014000	.002333	0.	0.	
17,000	68,000	.016333	.002333	0.	0.	
17,500	70,000	.018667	.002334	0.	0.	
18,000	72,000	.021167	.002500	0.	0.	
18,500	74,000	.024167	.003000	0.	0.	
19,000	76,000	.0267	.002533	0.	0.	
19,500	78,000	.0300	.0033	0.	0.	
20,000	80,000	.0333	.0033	0.	0.	
20,500	82,000	.0367	.0034	0.	0.	
21,000	84,000	.0400	.0033	0.	0.	
21,500	86,000	.0500	.0100	0.	0.	
22,000	88,000	.0600	.0100	0.	0.	
22,500	90,000	.0733	.0133	0.	0.	
23,000	92,000	.1000	.0267	0.	0.	Tensile strength.
23,120	92,480	.1233	.0233	0.	0.	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	92,480
Elastic limit per square inch of original section .....	do..	51,000
Elongation per inch after rupture .....	inch..	.1667
Elongation per inch under strain at elastic limit .....	do..	.001733
Reduction in diameter at point of rupture .....	do..	.134
Reduction in area after rupture, per centum of original section .....		41.9
Position of rupture .....	"5 from neck	
Character of broken surface .....	silky	
Elongation of inch sections .....	"11, "10, "29*	

No. 4222.

Marks, <sup>10</sup> W R J  
B T, ODiameter, <sup>11</sup> .564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
3,750	15,000	.000467	.000167	.....	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,200	25,000	.000800	.000167	.....	.....	
7,500	30,000	.001000	.000200	.....	.....	
8,750	35,000	.001233	.000233	.....	.....	
10,000	40,000	.001400	.000167	0.	.....	
11,250	45,000	.001633	.000233	.....	.....	
11,500	46,000	.001667	.000034	.....	.....	
11,750	47,000	.001700	.000033	.....	.....	
12,000	48,000	.001733	.000033	.....	.....	Elastic limit.
12,250	49,000	.001900	.000167	.....	.....	
12,500	50,000	.002167	.000267	.....	.....	
12,750	51,000	.002433	.000266	.....	.....	
13,000	52,000	.002933	.000500	.....	.....	
13,500	54,000	.003733	.000800	.....	.....	
14,000	56,000	.005833	.002100	.....	.....	
14,500	58,000	.008833	.003000	.....	.....	
15,000	60,000	.010667	.001833	.....	.....	
15,500	62,000	.012833	.002166	.....	.....	
16,000	64,000	.015000	.002167	.....	.....	
16,500	66,000	.017367	.002367	.....	.....	
17,000	68,000	.019833	.002466	.....	.....	
17,500	70,000	.023000	.003167	.....	.....	
18,000	72,000	.025833	.002833	.....	.....	
18,500	74,000	.029167	.003334	.....	.....	
19,000	76,000	.032667	.003500	.....	.....	
19,500	78,000	.036833	.004166	.....	.....	
20,000	80,000	.043000	.006167	.....	.....	
20,500	82,000	.0450	.0020	.....	.....	
21,000	84,000	.0567	.0117	.....	.....	
21,500	86,000	.0667	.0100	.....	.....	
22,000	88,000	.0867	.0200	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	88,000
Elastic limit per square inch of original section.....	do.....	48,000
Elongation per inch after rupture.....	inch.....	.1033
Elongation per inch under strain at elastic limit.....	do.....	.001733
Reduction in diameter at point of rupture.....	do.....	.084
Reduction in area after rupture, per centum of original section.....		27.6
Position of rupture.....	".4 from neck	
Character of broken surface.....	granular, 50 per cent.; dull flaky, 50 per cent.	
Elongation of inch sections.....	".19", ".07", ".05	

No. 4223.

Marks, <sup>10 W R J</sup><sub>B T<sub>2</sub> I</sub>

Diameter, ".560.

Sectional area, .246 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
246	1,000	0.	0.	0.	0.	Initial load.
1,230	5,000	.000167	.000167	.....	.....	
2,460	10,000	.000367	.000200	.....	.....	
3,690	15,000	.000533	.000166	.....	.....	
4,920	20,000	.000733	.000200	.....	.....	
6,150	25,000	.000933	.000200	.....	.....	
7,380	30,000	.001133	.000200	.....	.....	
8,610	35,000	.001300	.000167	.....	.....	
9,840	40,000	.001500	.000200	.....	.....	
11,070	45,000	.001767	.000267	.....	.....	
11,316	46,000	.001800	.000033	.....	.....	
11,562	47,000	.001867	.000067	.....	.....	
11,808	48,000	.001967	.000100	.....	.....	Elastic limit.
12,054	49,000	.002233	.000266	.....	.....	
12,300	50,000	.006400	.004167	.....	.....	
12,792	52,000	.011667	.005267	.....	.....	Tensile strength.
20,140	81,870	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 81,870  
 Elastic limit per square inch of original section ..... do... 48,000  
 Elongation per inch after rupture ..... inch... 0.1900  
 Elongation per inch under strain at elastic limit ..... do... .001967  
 Reduction in diameter at point of rupture ..... do... .150  
 Reduction in area after rupture, per centum of original section ..... 46.3  
 Position of rupture ..... ".7 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".33\*, ".13, ".11

No. 4224.

Marks, <sup>10 W R J</sup>  
<sub>B T, M</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 3'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000267	.000167	.....	.....	
3,750	15,000	.000400	.000133	.....	.....	
5,000	20,000	.000600	.000200	0.	.....	
6,250	25,000	.000767	.000167	.....	.....	
7,500	30,000	.000933	.000166	.....	.....	
8,750	35,000	.001100	.000167	.....	.....	
10,000	40,000	.001267	.000167	0.	.....	
11,250	45,000	.001533	.000266	.....	.....	
11,500	46,000	.001600	.000067	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001700	.000067	.....	.....	
12,250	49,000	.001733	.000033	.....	.....	Elastic limit.
12,500	50,000	.001900	.000167	.....	.....	
12,750	51,000	.002200	.000360	.....	.....	
13,000	52,000	.002533	.000333	.....	.....	
13,500	54,000	.003900	.001367	.....	.....	
14,000	56,000	.005633	.001733	.....	.....	
14,500	58,000	.007233	.001600	.....	.....	
15,000	60,000	.009233	.002000	.....	.....	
15,500	62,000	.011233	.002000	.....	.....	
16,000	64,000	.013367	.002134	.....	.....	
16,500	66,000	.015933	.002566	.....	.....	
17,000	68,000	.018533	.002600	.....	.....	
17,500	70,000	.021267	.002734	.....	.....	
18,000	72,000	.024367	.003100	.....	.....	
18,205	74,000	.028067	.003700	.....	.....	
19,000	76,000	.031267	.003200	.....	.....	Tensile strength.
19,500	78,000	.035000	.003733	.....	.....	
20,000	80,000	.0367	.0017	.....	.....	
20,500	82,000	.0400	.0033	.....	.....	
21,000	84,000	.0500	.0100	.....	.....	
21,500	86,000	.0667	.0167	.....	.....	
21,920	87,680	.0933	.0266	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	87,680
Elastic limit per square inch of original section .....	do...	49,000
Elongation per inch after rupture .....	inch.....	.1200
Elongation per inch under strain at elastic limit .....	do.....	.001733
Reduction in diameter at point of rupture .....	do.....	.134
Reduction in area after rupture, per centum of original section .....	.....	41.9
Position of rupture .....	" .35 from neck	
Character of broken surface .....	silky	
Elongation of inch sections .....	" .04, ".06, ".26	

No. 4225.

Marks, <sup>10</sup> W R JB T<sub>4</sub> IDiameter, <sup>11</sup> .564.

Sectional area, .25 square inch.

Gauged length, 3'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	0.	
2,500	10,000	.000333	.000200	0.	0.	
3,750	15,000	.000500	.000167	0.	0.	
5,000	20,000	.000667	.000167	0.	0.	
6,250	25,000	.000833	.000166	0.	0.	
7,500	30,000	.001033	.000200	0.	0.	
8,750	35,000	.001267	.000234	0.	0.	
10,000	40,000	.001467	.000200	.000067	.000067	
11,250	45,000	.001700	.000233	0.	0.	
11,500	46,000	.001767	.000067	0.	0.	
11,750	47,000	.001833	.000066	0.	0.	
12,000	48,000	.001900	.000067	0.	0.	
12,250	49,000	.001933	.000033	0.	0.	
12,500	50,000	.002033	.000100	0.	0.	
12,750	51,000	.002067	.000034	0.	0.	Elastic limit.
13,000	52,000	.002267	.000200	0.	0.	
13,250	53,000	.002400	.000133	0.	0.	
13,500	54,000	.002733	.000333	0.	0.	
13,750	55,000	.003067	.000334	0.	0.	
14,000	56,000	.003567	.000500	0.	0.	
14,500	58,000	.005267	.001700	0.	0.	
15,000	60,000	.007167	.001900	0.	0.	
15,500	62,000	.008600	.001433	0.	0.	
16,000	64,000	.010600	.002000	0.	0.	
16,500	66,000	.012600	.002000	0.	0.	
17,000	68,000	.015233	.002633	0.	0.	
17,500	70,000	.017167	.001934	0.	0.	
18,000	72,000	.019600	.002433	0.	0.	
18,500	74,000	.022000	.002400	0.	0.	
19,000	76,000	.025267	.003267	0.	0.	
19,500	78,000	.028933	.003666	0.	0.	
20,000	80,000	.032333	.003400	0.	0.	
20,500	82,000	.0350	.002667	0.	0.	
21,000	84,000	.0383	.0033	0.	0.	
21,500	86,000	.0433	.0050	0.	0.	
22,000	88,000	.0533	.0100	0.	0.	
22,500	90,000	.0667	.0134	0.	0.	
22,780	91,120	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 91,120  
 Elastic limit per square inch of original section ..... do.. 51,000  
 Elongation per inch after rupture ..... inch.. .0867  
 Elongation per inch under strain at elastic limit ..... do.. .002067  
 Reduction in diameter at point of rupture ..... do.. .054  
 Reduction in area after rupture, per centum of original section ..... 18.3  
 Position of rupture ..... " 4 from neck  
 Character of broken surface... granular, flaky surface, 70 per cent.; dull, smooth surface, 30 per cent  
 Elongation of inch sections ..... " 15, " 06, " 05



## RING A.

No. 3994.

Marks, <sup>10 W R<sub>1</sub> A</sup><sub>T<sub>1</sub> O</sub>Diameter, <sup>11</sup>/<sub>16</sub> .564.

Sectional area, .25 square inch.

Gauged length, 4''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per-square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000124	0.	.....	
2,500	10,000	.000325	.000200	.....	.....	
5,000	20,000	.000650	.000325	.....	.....	
7,500	30,000	.001000	.000350	.....	.....	
10,000	40,000	.001325	.000325	.....	.....	
11,250	45,000	.001450	.000125	0.	.....	
12,500	50,000	.001675	.000225	.000025	.000025	
12,750	51,000	.001700	.000025	.....	.....	
13,000	52,000	.001750	.000050	.....	.....	
13,250	53,000	.001775	.000025	.....	.....	
13,500	54,000	.001825	.000050	.....	.....	
13,750	55,000	.001875	.000050	.....	.....	
14,000	56,000	.001950	.000075	.....	.....	
14,250	57,000	.002000	.000050	.....	.....	Elastic limit.
14,500	58,000	.002100	.000100	.....	.....	
14,750	59,000	.002200	.000100	.....	.....	
15,000	60,000	.002325	.000125	.....	.....	
15,500	62,000	.002675	.000350	.....	.....	
16,000	64,000	.003250	.000575	.....	.....	
16,500	66,000	.004125	.000875	.....	.....	
17,000	68,000	.005250	.001125	.....	.....	
17,500	70,000	.006575	.001325	.....	.....	
27,820	111,280	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 111,280  
 Elastic limit per square inch of original section ..... do. 57,000  
 Elongation per inch after rupture ..... inch. .090  
 Elongation per inch under strain at elastic limit ..... do. .002000  
 Reduction in diameter at point of rupture ..... do. .054  
 Reduction in area after rupture, per centum of original section ..... 18.3  
 Position of rupture ..... 2''.1 from neck  
 Character of broken surface ..... granular; small dull spot near the circumference  
 Elongation of inch sections ..... '' .05, '' .15, '' .10, '' .06

No. 3995.

Marks, <sup>10 W R, A</sup><sub>T<sub>2</sub> I</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.	0.	
2,500	10,000	.000200	.000125	.....	.....	
5,000	20,000	.000475	.000275	.....	.....	
7,500	30,000	.000825	.000350	.....	.....	
10,000	40,000	.001125	.000300	.....	.....	
11,250	45,000	.001300	.000175	0.	.....	
12,500	50,000	.001550	.000250	0.	.....	
12,750	51,000	.001600	.000050	.....	.....	
13,000	52,000	.001650	.000050	.....	.....	Elastic limit.
13,250	53,000	.001700	.000050	.....	.....	
13,500	54,000	.001775	.000075	.....	.....	
13,750	55,000	.001875	.000100	.....	.....	
14,000	56,000	.002000	.000125	.....	.....	
14,250	57,000	.002125	.000125	.....	.....	
14,750	59,000	.002550	.000425	.....	.....	
15,250	61,000	.003200	.000650	.....	.....	
15,750	63,000	.004250	.001050	.....	.....	
16,250	65,000	.005500	.001250	.....	.....	Tensile strength.
16,750	67,000	.007075	.001575	.....	.....	
27,040	108,160	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 108,160  
 Elastic limit per square inch of original section.....do... 54,000  
 Elongation per inch after rupture.....inch... .1175  
 Elongation per inch under strain at elastic limit.....do... .001775  
 Reduction in diameter at point of rupture.....do... .064  
 Reduction in area after rupture, per centum of original section.....21.4  
 Position of rupture.....1".8 from neck  
 Character of broken surface.....granular, dull spot at the circumference  
 Elongation of inch sections.....".09, ".20, ".10, ".08

No. 3697.

Marks,  $10 W R_1 A$   
 $T_2 M$ Diameter,  $\frac{1}{2}$  .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000625	.000325	.....	.....	
7,500	30,000	.001000	.000375	.....	.....	
10,000	40,000	.001325	.000325	.....	.....	
11,250	45,000	.001500	.000175	.000100	.000100	
12,500	50,000	.001800	.000300	.000100	0.	
12,750	51,000	.001850	.000050	.....	.....	
13,000	52,000	.001925	.000075	.....	.....	Elastic limit.
13,250	53,000	.002000	.000075	.....	.....	
13,500	54,000	.002175	.000175	.....	.....	
13,750	55,000	.002375	.000200	.....	.....	
14,000	56,000	.002625	.000250	.....	.....	
14,500	58,000	.003300	.000675	.....	.....	
15,000	60,000	.004250	.000950	.....	.....	
15,500	62,000	.005250	.001000	.....	.....	
16,000	64,000	.006550	.001300	.....	.....	
16,500	66,000	.008125	.001575	.....	.....	
26,520	106,080	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 106,080  
 Elastic limit per square inch of original section ..... do... 53,000  
 Elongation per inch after rupture ..... inch... .1125  
 Elongation per inch under strain at elastic limit ..... do... .002000  
 Reduction in diameter at point of rupture ..... do... .064  
 Reduction in area after rupture, per centum of original section ..... 21.4  
 Position of rupture ..... 1" .45 from neck  
 Character of broken surface ..... granular, dull spot at the circumference  
 Elongation of inch sections ..... ".05, ".09, ".19, ".12

HOOP C<sub>3</sub>.

No. 4302.

Marks, <sup>10 W R<sub>1</sub> C<sub>3</sub></sup>  
<sub>T<sub>1</sub> I</sub>

Diameter, ".567.

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000175	.000175	.....	.....	
2,520	10,000	.000300	.000125	.....	.....	
2,780	15,000	.000475	.000175	.....	.....	
5,040	20,000	.000650	.000175	.....	.....	
6,300	25,000	.000775	.000125	.....	.....	
7,056	28,000	.000850	.000075	.....	.....	
7,560	30,000	.001250	.000400	.000575	.000575	
7,812	31,000	.009500	.008250	.....	.....	
8,064	32,000	.011125	.001625	.....	.....	Elastic limit.
8,316	33,000	.011750	.000625	.....	.....	
8,568	34,000	.012750	.001000	.....	.....	
8,820	35,000	.014000	.001250	.....	.....	
9,072	36,000	.015425	.001425	.....	.....	
9,324	37,000	.016625	.001200	.....	.....	
9,576	38,000	.018000	.001375	.....	.....	
9,828	39,000	.019125	.001125	.....	.....	
10,080	40,000	.020750	.001625	.....	.....	
10,584	42,000	.0225	.001750	.....	.....	
11,088	44,000	.0250	.0025	.....	.....	
11,592	46,000	.0275	.0025	.....	.....	
12,096	48,000	.0300	.0025	.....	.....	
12,600	50,000	.0375	.0075	.....	.....	
13,104	52,000	.0425	.0050	.....	.....	
13,608	54,000	.0475	.0050	.....	.....	
14,112	56,000	.0550	.0075	.....	.....	
14,616	58,000	.0675	.0125	.....	.....	
15,120	60,000	.0800	.0125	.....	.....	
15,624	62,000	.0950	.0150	.....	.....	
16,128	64,000	.1175	.0225	.....	.....	
16,632	66,000	.1775	.0600	.....	.....	Tensile strength.
16,640	66,030	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 66,030  
 Elastic limit per square inch of original section ..... do... 28,000  
 Elongation per inch after rupture ..... inch... .2700  
 Elongation per inch under strain at elastic limit ..... do... .000850  
 Reduction in diameter at point of rupture ..... do... .137  
 Reduction in area after rupture, per centum of original section ..... do... 42.4  
 Position of rupture ..... 2".25 from neck  
 Character of broken surface, granular, 50 per cent.; silky, 50 per cent. Opened cracks in surface of stem.  
 Elongation of inch sections ..... ".18, ".25 ".43\*, ".22

No. 4303.

Marks, <sup>10</sup> W R C<sub>s</sub>  
<sub>T<sub>2</sub> O</sub>Diameter, <sup>11</sup> .566.

Sectional area, .252 square inch.

Gauged length 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000150	.000150	0.	.....	
2,520	10,000	.000300	.000150	.....	.....	
3,780	15,000	.000450	.000150	.....	.....	
5,040	20,000	.000650	.000200	0.	.....	
6,300	25,000	.000825	.000175	.....	.....	
6,552	26,000	.000875	.000050	.....	.....	
6,804	27,000	.000925	.000050	.....	.....	Elastic limit.
7,056	28,000	.001200	.000275	.....	.....	
7,308	29,000	.005375	.007175	.....	.....	
7,560	30,000	.009550	.001175	.....	.....	
8,064	32,000	.011125	.001575	.....	.....	
8,568	34,000	.013500	.002375	.....	.....	
9,072	36,000	.015450	.001950	.....	.....	
9,576	38,000	.018250	.002800	.....	.....	
10,080	40,000	.021000	.002750	.....	.....	
10,584	42,000	.0225	.0015	.....	.....	
11,088	44,000	.0250	.0025	.....	.....	Tensile strength.
11,592	46,000	.0275	.0025	.....	.....	
12,096	48,000	.0300	.0025	.....	.....	
12,600	50,000	.0400	.0100	.....	.....	
13,104	52,000	.0475	.0075	.....	.....	
13,608	54,000	.0550	.0075	.....	.....	
14,112	56,000	.0600	.0050	.....	.....	
14,616	58,000	.0700	.0100	.....	.....	
15,120	60,000	.0775	.0075	.....	.....	
15,624	62,000	.0950	.0175	.....	.....	
16,128	64,000	.1250	.0300	.....	.....	
16,470	65,360	.1800	.0550	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	65,360
Elastic limit per square inch of original section.....	do..	27,000
Elongation per inch after rupture.....	inch..	.1800
Elongation per inch under strain at elastic limit.....	do..	.000925
Reduction in diameter at point of rupture.....	do..	.086
Reduction in area after rupture, per centum of original section.....		28.2
Position of rupture.....		" .35 from neck
Character of broken surface.....		granular, dull spot at circumference
Elongation of inch sections.....		" .15, " .16, " .18, " .23

HOOP C<sub>4</sub>.

No. 4304.

Marks, <sup>10</sup>W R<sub>1</sub> C<sub>4</sub>  
T<sub>1</sub> M

Diameter, ".566.

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
252	1,000	0.	0.	0.	0.	
1,260	5,000	.000150	.000150	0.	0.	
2,520	10,000	.000300	.000300			
3,780	15,000	.000500	.000200			
5,040	20,000	.000675	.000175	.000025	.000025	
6,300	25,000	.000800	.000125			
7,560	30,000	.001025	.000225			
7,812	31,000	.001050	.000025			
8,064	32,000	.001125	.000075			
8,316	33,000	.001175	.000000			
8,568	34,000	.001225	.000050			
8,820	35,000	.001250	.000025			
9,072	36,000	.001275	.000025			
9,324	37,000	.001300	.000025			Elastic limit.
9,576	38,000	.001450	.000150			
9,828	39,000	.012125	.010675			
10,080	40,000	.014175	.002050			
10,584	42,000	.016000	.001825			
11,088	44,000	.018750	.002750			
11,592	46,000	.021875	.003125			
12,096	48,000	.024500	.002625			
12,600	50,000	.028500	.004000			
13,104	52,000	.0325	.0040			
13,608	54,000	.0375	.0050			
14,112	56,000	.0425	.0050			
14,616	58,000	.0475	.0050			
15,120	60,000	.0550	.0075			
15,624	62,000	.0625	.0075			
16,128	64,000	.0750	.0125			
16,632	66,000	.0875	.0125			
17,136	68,000	.1075	.0200			
17,640	70,000	.1650	.0575			
17,680	70,190	.2000	.0350			Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 70,190  
 Elastic limit per square inch of original section ..... do... 37,000  
 Elongation per inch after rupture ..... inch... .2650  
 Elongation per inch under strain at elastic limit ..... do... .001300  
 Reduction in diameter at point of rupture ..... do... .156  
 Reduction in area after rupture, per centum of original section ..... 47.6  
 Position of rupture ..... 1".50 from neck  
 Character of broken surface ..... fine, silky  
 Elongation of inch sections ..... ".17, ".21, ".32, ".36

No. 4305.

Marks, <sup>10 W R C</sup><sub>T<sub>2</sub> I</sub>Diameter, <sup>11</sup>/<sub>16</sub> 565.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000250	.000125	.....	.....	
3,750	15,000	.000450	.000200	.....	.....	
5,000	20,000	.000650	.000200	0.	.....	
6,250	25,000	.000800	.000150	.....	.....	
7,500	30,000	.000975	.000175	.....	.....	
7,750	31,000	.001000	.000025	.....	.....	
8,000	32,000	.001050	.000050	.....	.....	
8,250	33,000	.001125	.000075	.....	.....	
8,500	34,000	.001175	.000050	.....	.....	Elastic limit.
8,750	35,000	.001200	.000025	.....	.....	
9,000	36,000	.001250	.000050	.....	.....	
9,250	37,000	.001300	.000050	.....	.....	
9,500	38,000	.001375	.000075	.....	.....	
9,750	39,000	.011250	.009875	.....	.....	
10,000	40,000	.012125	.008875	.....	.....	
10,250	41,000	.012925	.008000	.....	.....	
10,500	42,000	.014000	.001075	.....	.....	
10,750	43,000	.015000	.001000	.....	.....	
11,000	44,000	.016750	.001750	.....	.....	Tensile strength.
11,500	46,000	.019250	.002500	.....	.....	
12,000	48,000	.021875	.002625	.....	.....	
12,500	50,000	.026000	.004125	.....	.....	
13,000	52,000	.029750	.003750	.....	.....	
13,500	54,000	.033500	.003750	.....	.....	
14,000	56,000	.038125	.004625	.....	.....	
14,500	58,000	.0425	.004375	.....	.....	
15,000	60,000	.0500	.0075	.....	.....	
15,500	62,000	.0575	.0075	.....	.....	
16,000	64,000	.0675	.0100	.....	.....	
16,500	66,000	.0800	.0125	.....	.....	
17,000	68,000	.1000	.0200	.....	.....	
17,500	70,000	.1250	.0250	.....	.....	
17,760	71,040	.1950	.0700	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	71,040
Elastic limit per square inch of original section .....	do..	58,000
Elongation per inch after rupture .....	inch..	.2525
Elongation per inch under strain at elastic limit .....	do..	.001375
Reduction in diameter at point of rupture .....	do..	.155
Reduction in area after rupture, per centum of original section .....		47.2
Position of rupture .....	1" 6 from neck	
Character of broken surface .....	silky oblique	
Elongation of inch sections .....	" 25, " 38", " 21, " 17	

H. Ex. 165—7

No. 4306.

Marks, <sup>10</sup> W R C.T<sub>2</sub> O

Diameter, ".567

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000150	.000150	0.	0.	
2,520	10,000	.000300	.000300	0.	0.	
3,780	15,000	.000475	.000475	0.	0.	
5,040	20,000	.000650	.000650	0.	0.	
6,300	25,000	.000800	.000800	0.	0.	
7,560	30,000	.000975	.000975	0.	0.	
8,820	35,000	.001200	.001200	0.	0.	
9,072	36,000	.001250	.001250	0.	0.	
9,324	37,000	.001275	.001275	0.	0.	
9,576	38,000	.001300	.001300	0.	0.	Elastic limit.
9,828	39,000	.001325	.001325	0.	0.	
10,080	40,000	.001425	.001425	0.	0.	
10,332	41,000	.006550	.005125	0.	0.	
10,584	42,000	.009950	.003400	0.	0.	
11,088	44,000	.011875	.001925	0.	0.	
11,592	46,000	.013750	.001875	0.	0.	
12,096	48,000	.015500	.001750	0.	0.	
12,600	50,000	.018125	.002625	0.	0.	
13,104	52,000	.021000	.002875	0.	0.	
13,608	54,000	.023200	.002200	0.	0.	Tensile strength.
14,112	56,000	.026250	.003050	0.	0.	
14,616	58,000	.029125	.002875	0.	0.	
15,120	60,000	.031250	.002121	0.	0.	
15,624	62,000	.0375	.006250	0.	0.	
16,128	64,000	.0425	.0050	0.	0.	
16,632	66,000	.0475	.0050	0.	0.	
17,136	68,000	.0525	.0050	0.	0.	
17,640	70,000	.0575	.0050	0.	0.	
18,144	72,000	.0700	.0125	0.	0.	
18,648	74,000	.0800	.0100	0.	0.	
19,152	76,000	.0975	.0175	0.	0.	
19,656	78,000	.1250	.0275	0.	0.	
19,810	78,610	.1575	.0325	0.	0.	

## General summary.

Tensile strength per square inch of original section.....	pounds..	78,610
Elastic limit per square inch of original section.....	do.	39,000
Elongation per inch after rupture.....	inch..	.1725
Elongation per inch under strain at elastic limit.....	do.	.001325
Reduction in diameter at point of rupture.....	do.	.087
Reduction in area after rupture, per centum of original section.....		28.2
Position of rupture.....		".75 from neck
Character of broken surface.....	fine granular, 60 per cent.; silky serrated, 40 per cent.	
Elongation of inch sections.....		".25*, ".16, ".15, ".13



HOOP C<sub>5</sub>.

No. 4307.

Marks, <sup>10</sup> W R, C<sub>5</sub>  
<sub>T, M</sub>Diameter, <sup>11</sup> .567.

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000125	.000125	0.	0.	
2,520	10,000	.000275	.000150	.....	.....	
3,780	15,000	.000450	.000175	.....	.....	
5,040	20,000	.000675	.000225	0.	.....	
6,300	25,000	.000800	.000125	.....	.....	
7,560	30,000	.001000	.000200	.....	.....	
7,812	31,000	.001025	.000025	.....	.....	
8,064	32,000	.001050	.000025	.....	.....	
8,316	33,000	.001075	.000025	.....	.....	
8,568	34,000	.001125	.000050	.....	.....	Elastic limit.
8,820	35,000	.001175	.000050	.....	.....	
9,072	36,000	.001225	.000050	.....	.....	
9,324	37,000	.001275	.000050	.....	.....	
9,576	38,000	.004000	.002725	.....	.....	
9,828	39,000	.005500	.001500	.....	.....	
10,080	40,000	.011500	.006000	.....	.....	
10,584	42,000	.020625	.009125	.....	.....	
11,088	44,000	.024000	.003375	.....	.....	
11,592	46,000	.028125	.004125	.....	.....	
12,096	48,000	.032500	.004375	.....	.....	Tensile strength.
12,600	50,000	.0400	.0075	.....	.....	
13,104	52,000	.0450	.0050	.....	.....	
13,608	54,000	.0500	.0050	.....	.....	
14,112	56,000	.0575	.0075	.....	.....	
14,616	58,000	.0700	.0125	.....	.....	
15,120	60,000	.0825	.0125	.....	.....	
15,400	61,110	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section..... pounds.. 61,110  
 Elastic limit per square inch of original section..... do... 37,000  
 Elongation per inch after rupture..... inch.. .1150  
 Elongation per inch under strain at elastic limit..... do... .001275  
 Reduction in diameter at point of rupture..... do... .067  
 Reduction in area after rupture, per centum of original section..... 22.2  
 Position of rupture..... 2" from neck  
 Character of broken surface..... silky  
 Elongation of inch sections..... ".10, ".17, ".10, ".09

No. 4308.

Marks,  $^{10}W R_1 C_5$   
 $^{T_2}M$ Diameter,  $\frac{1}{2}$ " .566.

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000150	.000150	0.	.....	
2,520	10,000	.000275	.000125	.....	.....	
3,780	15,000	.000475	.000200	.....	.....	
5,040	20,000	.000625	.000150	0.	.....	
6,300	25,000	.000775	.000150	.....	.....	
7,560	30,000	.000975	.000200	.....	.....	
8,820	35,000	.001175	.000200	.....	.....	
9,072	36,000	.001225	.000050	.....	.....	
9,324	37,000	.001250	.000025	.....	.....	
9,576	38,000	.001300	.000050	.....	.....	
9,828	39,000	.001350	.000050	.....	.....	
10,080	40,000	.001400	.000050	.....	.....	Elastic limit.
10,332	41,000	.023375	.021975	.....	.....	
10,584	42,000	.024950	.001575	.....	.....	
10,836	43,000	.026250	.001300	.....	.....	
11,088	44,000	.028500	.002250	.....	.....	
11,592	46,000	.033925	.005425	.....	.....	
12,096	48,000	.038250	.004325	.....	.....	
12,600	50,000	.0425	.004250	.....	.....	
13,104	52,000	.0500	.0075	.....	.....	
13,608	54,000	.0600	.0100	.....	.....	
14,112	56,000	.0700	.0100	.....	.....	
14,616	58,000	.0875	.0175	.....	.....	
15,120	60,000	.1075	.0200	.....	.....	
15,550	61,710	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 61.700  
 Elastic limit per square inch of original section ..... do... 40,000  
 Elongation per inch after rupture ..... inch... .1700  
 Elongation per inch under strain at elastic limit ..... do... .001400  
 Reduction in diameter at point of rupture ..... do... .116  
 Reduction in area after rupture, per centum of original section ..... 36.9  
 Position of rupture ..... 1".35 from neck  
 Character of broken surface ..... silky; metal ruptured at a crack which extended from the circum-  
 ference to the center of the specimen. The walls of the crack were dark colored.  
 Elongation of inch sections ..... ".13, ".15, ".15, ".25\*

No. 4309.

Marks, <sup>10</sup> W R, C,  
<sub>T<sub>3</sub> M</sub>

Diameter, ".567.

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000150	.000150	0.	.....	
2,520	10,000	.000300	.000150	.....	.....	
3,780	15,000	.000450	.000150	.....	.....	
5,040	20,000	.000675	.000225	0.	.....	
6,300	25,000	.000825	.000150	.....	.....	
7,560	30,000	.001000	.000175	.....	.....	
8,820	35,000	.001200	.000200	.....	.....	
9,072	36,000	.001250	.000050	.....	.....	
9,324	37,000	.001275	.000025	.....	.....	
9,576	38,000	.001300	.000025	.....	.....	Elastic limit.
9,828	39,000	.001375	.000075	.....	.....	
10,080	40,000	.008950	.007575	.....	.....	
10,332	41,000	.011125	.002175	.....	.....	
10,584	42,000	.019450	.008325	.....	.....	
11,088	44,000	.022450	.003000	.....	.....	
11,592	46,000	.026125	.003675	.....	.....	
12,096	48,000	.029175	.003625	.....	.....	
12,600	50,000	.034750	.005000	.....	.....	
13,104	52,000	.040250	.005500	.....	.....	
13,608	54,000	.0475	.007250	.....	.....	Tensile strength.
14,112	56,000	.0525	.0050	.....	.....	
14,616	58,000	.0625	.0100	.....	.....	
15,120	60,000	.0750	.0125	.....	.....	
15,624	62,000	.0950	.0200	.....	.....	
16,128	64,000	.1175	.0225	.....	.....	
16,270	64,560	.1500	.0325	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 64,560  
 Elastic limit per square inch of original section ..... do... 39,000  
 Elongation per inch after rupture ..... inch... .1500  
 Elongation per inch under strain at elastic limit..... do... .001375  
 Reduction in diameter at point of rupture ..... do... .087  
 Reduction in area after rupture, per centum of original section..... 28.2  
 Position of rupture..... ".35 from neck  
 Character of broken surface..... silky; contains two small spots of light colored metal  
 Elongation of inch sections ..... ".10, ".11, ".16, ".23"

Hoop C<sub>6</sub>.

No. 4310.

Marks, <sup>10</sup> W R C<sub>6</sub>  
<sub>T<sub>1</sub> M</sub>

Diameter, ".566.

Sectional area, .252 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000150	.000150	0.	0.	
2,520	10,000	.000325	.000175			
3,780	15,000	.000500	.000175			
5,040	20,000	.000675	.000175	0.		
6,300	25,000	.000800	.000125			
7,560	30,000	.001000	.000200			
8,820	35,000	.001175	.000175			
9,072	36,000	.001225	.000050			
9,324	37,000	.001250	.000025			
9,576	38,000	.001275	.000025			Elastic limit.
9,828	39,000	.001300	.000025			
10,080	40,000	.005375	.004075			
10,332	41,000	.007925	.002550			
10,584	42,000	.015750	.007825			
11,088	44,000	.022625	.006875			
11,592	46,000	.025300	.002675			
12,096	48,000	.029750	.004450			
12,600	50,000	.034250	.004500			
13,104	52,000	.038125	.003875			
13,608	54,000	.0450	.006875			Tensile strength.
14,112	56,000	.0500	.0050			
14,616	58,000	.0550	.0050			
15,120	60,000	.0675	.0125			
15,624	62,000	.0775	.0100			
16,128	64,000	.0925	.0150			
16,632	66,000	.1175	.0250			
17,136	68,000	.1600	.0425			

## General summary.

Tensile strength per square inch of original section.....	pounds..	68,000
Elastic limit per square inch of original section .....	do ..	39,000
Elongation per inch after rupture.....	inch..	.2050
Elongation per inch under strain at elastic limit .....	do..	.001300
Reduction in diameter at point of rupture .....	do..	.096
Reduction in area after rupture, per centum of original section .....		31.0
Position of rupture .....	"	.75 from neck
Character of broken surface .....		silky, oblique
Elongation of inch sections .....	"	.16, ".18, ".18, ".30*

No. 4311.

Marks,  $10 W R_1 C_6$   
 $T_2 M$ Diameter,  $\frac{1}{2}$  567.

Sectional area, .252 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000125	.000125	0.	0.	
2,520	10,000	.000300	.000175	.....	.....	
3,780	15,000	.000475	.000175	.....	.....	
5,040	20,000	.000650	.000175	0.	.....	
6,300	25,000	.000800	.000150	.....	.....	
7,560	30,000	.000975	.000175	.....	.....	
7,812	31,000	.001025	.000050	.....	.....	
8,064	32,000	.001050	.000025	.....	.....	
8,316	33,000	.001075	.000025	.....	.....	
8,568	34,000	.001125	.000050	.....	.....	
8,820	35,000	.001150	.000025	.....	.....	
9,072	36,000	.001200	.000050	.....	.....	
9,324	37,000	.001225	.000025	.....	.....	
9,576	38,000	.001275	.000050	.....	.....	
9,828	39,000	.001300	.000025	.....	.....	
10,080	40,000	.001350	.000050	.....	.....	Elastic limit.
10,332	41,000	.006250	.004900	.....	.....	
10,584	42,000	.016750	.010500	.....	.....	
11,088	44,000	.019700	.002950	.....	.....	
11,592	46,000	.022625	.002925	.....	.....	
12,096	48,000	.025500	.002875	.....	.....	
12,600	50,000	.029625	.004125	.....	.....	
13,104	52,000	.033750	.004125	.....	.....	
13,608	54,000	.038125	.004375	.....	.....	
14,112	56,000	.043625	.005500	.....	.....	
14,616	58,000	.0500	.006375	.....	.....	
15,120	60,000	.0550	.0050	.....	.....	
15,624	62,000	.0675	.0125	.....	.....	
16,128	64,000	.0775	.0100	.....	.....	
16,632	66,000	.0925	.0150	.....	.....	
17,136	68,000	.1150	.0225	.....	.....	
17,640	70,000	.1550	.0400	.....	.....	Tensile strength.
17,700	70,240	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 70,240  
 Elastic limit per square inch of original section ..... do... 40,000  
 Elongation per inch after rupture ..... inch... .1925  
 Elongation per inch under strain at elastic limit ..... do... .001350  
 Reduction in diameter at point of rupture ..... do... .107  
 Reduction in area after rupture, per centum of original section ..... 84.1  
 Position of rupture ..... 1' 7 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".16, ".16, ".27, ".18

No. 4312.

Marks, 10 W R<sub>1</sub> C<sub>8</sub>  
T<sub>3</sub> MDiameter,  $\frac{11}{16}$  567.

Sectional area, .252 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000125	.000125	0.	.....	
2,520	10,000	.000300	.000175	.....	.....	
3,780	15,000	.000450	.000150	.....	.....	
5,040	20,000	.000625	.000175	0.	.....	
6,300	25,000	.000800	.000175	.....	.....	
7,560	30,000	.000975	.000175	.....	.....	
7,812	31,000	.001000	.000025	.....	.....	
8,064	32,000	.001025	.000025	.....	.....	
8,316	33,000	.001075	.000050	.....	.....	
8,568	34,000	.001125	.000050	.....	.....	
8,820	35,000	.001175	.000050	.....	.....	
9,072	36,000	.001225	.000050	.....	.....	
9,324	37,000	.001250	.000025	.....	.....	
9,576	38,000	.001300	.000050	.....	.....	Elastic limit.
9,828	39,000	.001375	.000075	.....	.....	
10,080	40,000	.008200	.008225	.....	.....	
10,332	41,000	.010000	.001800	.....	.....	
10,584	42,000	.019700	.009700	.....	.....	
11,088	44,000	.022200	.002500	.....	.....	
11,592	46,000	.025750	.003550	.....	.....	
12,096	48,000	.029450	.003700	.....	.....	
12,600	50,000	.033750	.004300	.....	.....	
13,104	52,000	.037375	.003625	.....	.....	
13,608	54,000	.043000	.005625	.....	.....	Tensile strength.
14,112	56,000	.0475	.0045	.....	.....	
14,616	58,000	.0575	.0100	.....	.....	
15,120	60,000	.0700	.0125	.....	.....	
15,460	61,350	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 61,350  
 Elastic limit per square inch of original section.....do... 39,000  
 Elongation per inch after rupture.....inch... .1000  
 Elongation per inch under strain at elastic limit.....do... .001375  
 Reduction in diameter at point of rupture.....do... .097  
 Reduction in area after rupture, per centum of original section.....do... 31.0  
 Position of rupture.....".75 from neck  
 Character of broken surface.....silky; specimen tore apart, fracture beginning at a dull yellowish  
 spot at circumference.  
 Elongation of inch sections.....".17\*, ".08, ".08, ".07

TABULATION OF TENSION SPECIMENS FROM 10-INCH WIRE-WOUND RIFLE.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength, per square inch.	Elongation.	Contraction of area.	Appearance of fracture.	Remarks.
			Pounds.	Pounds.	Per cent.	Per cent.		
3958	Tube	Inside	38,000	85,080	47.2	Silky		Manufactured by Schneider & Co., Crouset, France.
3959	do	Outside	43,000	89,840	49.7	do		
3960	do	Middle	38,000	82,040	49.7	do		
3961	do	Inside	37,000	84,640	47.2	do		
3962	do	Outside	45,000	85,920	52.2	do		
3963	do	Middle	37,000	81,920	49.7	do		
3964	do	Inside	45,000	89,960	36.4	Silky, slightly granular.		
3965	do	Outside	46,000	88,280	52.2	Silky		
3966	do	Middle	47,000	90,440	30.6	Granular, 60 per cent.; silky, 40 per cent.		
3967	do	Inside	44,000	87,960	36.4	Silky oblique		
3968	do	Outside	47,000	86,880	49.7	Silky		Manufactured by the Standard Steel Casting Co., Thunlow, Pa.
3969	do	Middle	45,000	86,800	54.6	do		
4217	Jackey	Inside	52,000	87,760	3.7	Granular, dark spongy spot.		
4218	do	Outside	49,000	91,840	7.3	Granular, 50 per cent.; dull silky, 50 per cent.		
4219	do	Middle	46,000	74,720	3.0	Granular, and dark spongy		
4220	do	do	42,000	64,000	6.0	Dull silky, and dark spongy		
4221	do	Inside	51,000	92,480	16.7	Silky		
4222	do	Outside	48,000	88,000	27.6	Granular, 50 per cent.; dull flaky, 50 per cent.		
4223	do	Middle	48,000	81,870	46.3	Silky		
4224	do	Inside	49,000	87,680	12.0	do		
4225	do	do	51,000	91,120	8.7	Granular flaky, 70 per cent.; dull smooth, 30 per cent.		
4302	Hoop C <sub>5</sub>	do	27,000	66,030	27.0	Granular, 50 per cent.; silky, 50 per cent.		
4303	do	Outside	27,000	65,360	18.0	Granular, with dull spot.		
4304	Hoop C <sub>4</sub>	Middle	37,000	70,190	26.5	Fine silky		
4305	do	Inside	38,000	71,040	47.2	Silky oblique		
4306	do	Outside	39,000	78,610	28.2	Fine granular, 60 per cent.; silky serrated, 40 per cent.		
4307	Hoop C <sub>5</sub>	Middle	37,000	61,110	11.5	Silky		
4308	do	do	40,000	61,710	17.0	do		
4309	do	do	38,000	64,560	28.2	do		
4310	Hoop C <sub>6</sub>	do	39,000	68,000	15.0	Silky oblique		
4311	do	do	40,000	70,240	20.5	do		
4312	do	do	39,000	70,240	19.3	do		
3994	Ring A	do	39,000	61,850	10.0	do		
3995	do	Outside	57,000	111,280	9.0	Granular		
3996	do	Inside	54,000	108,160	11.8	do		
3996	do	Middle	53,000	106,080	11.3	do		

TABULATION OF COMPRESSION SPECIMENS FROM TUBE FOR 10-INCH WIRE-WOUND RIFLE.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.	Remarks.
814	Tube .....	Inside .....	Pounds.	Pounds.	Triple flexure .....	Manufactured by Schneider & Co., Creusot, France.
815	do .....	Outside .....	40,000	76,100	do .....	
816	do .....	Radial .....	41,000	79,040	do .....	
817	do .....	do .....	39,600	89,900	do .....	
818	do .....	do .....	46,000	86,800	do .....	
819	do .....	Inside .....	46,000	81,880	do .....	
820	do .....	Outside .....	48,000	77,420	do .....	
	do .....	Radial .....	45,000	102,200	do .....	



---

12-INCH B. L. RIFLE, NO. 1.

---

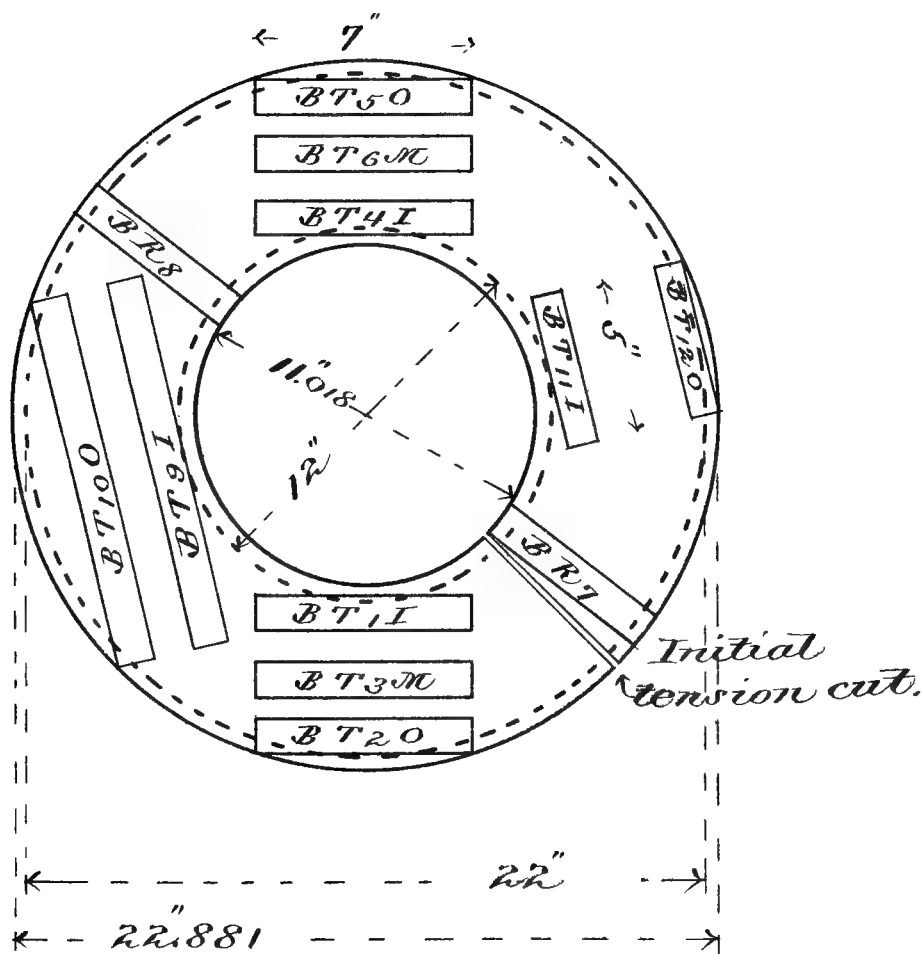
SPECIMENS FROM TUBE, JACKET, HOOPS, GAS CHECK,  
AND BREECH BUSHING.

---



# 12 inch B. L. Rifle

## Breech end of Tube





## SPECIMENS FROM TUBE.

## BREECH END.

No. 3887.

Marks, <sup>12 R T</sup><sub>B T, I</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	-----	
2,500	10,000	.000300	.000175	0.	-----	
5,000	20,000	.000650	.000350	0.	-----	
6,250	25,000	.000800	.000150	-----	-----	
7,500	30,000	.001025	.000225	.000025	.000025	
8,750	35,000	.001250	.000225	.000050	.000025	
9,000	36,000	.001275	.000050	-----	-----	
9,250	37,000	.001300	.000025	-----	-----	
9,500	38,000	.001375	.000075	-----	-----	
9,750	39,000	.001450	.000075	-----	-----	Elastic limit.
10,000	40,000	.001500	.000050	.000225	.000175	
10,250	41,000	.001625	.000125	-----	-----	
10,500	42,000	.001825	.000200	-----	-----	
10,750	43,000	.002000	.000175	-----	-----	
11,000	44,000	.002300	.000300	-----	-----	
11,250	45,000	.002650	.000350	-----	-----	
11,500	46,000	.003375	.000725	-----	-----	
12,000	48,000	.004900	.001525	-----	-----	
12,500	50,000	.007250	.002350	-----	-----	
13,000	52,000	.009700	.002450	-----	-----	Tensile strength. At time of rupture.
13,500	54,000	.012000	.002300	-----	-----	
14,000	56,000	.014750	.002750	-----	-----	
14,500	58,000	.017450	.002700	-----	-----	
15,000	60,000	.020250	.002800	-----	-----	
15,500	62,000	.023375	.003125	-----	-----	
16,000	64,000	.026875	.003500	-----	-----	
16,500	66,000	.030500	.003625	-----	-----	
17,000	68,000	.035000	.004500	-----	-----	
17,500	70,000	.040375	.005375	-----	-----	
18,000	72,000	.0500	.008625	-----	-----	
18,500	74,000	.0550	.0050	-----	-----	
19,000	76,000	.0650	.0100	-----	-----	
19,500	78,000	.0825	.0175	-----	-----	
19,810	79,240	.1150	.0325	-----	-----	
18,100	-----	-----	-----	-----	-----	

## General summary.

Tensile strength per square inch of original section ..... pounds .. 79,240  
 Elastic limit per square inch of original section ..... do. .... 40,000  
 Elongation per inch after rupture ..... inch. .... .1425  
 Elongation per inch under strain at elastic limit ..... do. .... .001500  
 Reduction in diameter at point of rupture ..... do. .... .114  
 Reduction in area after rupture, per centum of original section ..... .. 36.4  
 Position of rupture ..... ".25 from neck  
 Character of broken surface ..... dull silky, oblique, contains numerous parallel lines of bright luster  
 arranged nearly normal to the axis of the specimen. These lines appear to result from the separation  
 of the metal at cylindrical cavities ".01 diameter by ".04 to ".08 long.  
 Fine cracks developed in surface of stem.  
 Elongation of inch sections ..... ".10, ".08, ".09, ".30\*

No. 3888.

Marks, <sup>12 R T</sup><sub>BT, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000300	.000175	.....	.....	
5,000	20,000	.000600	.000300	0.	.....	
6,250	25,000	.000775	.000175	.....	.....	
7,500	30,000	.000975	.000200	0.	.....	
7,750	31,000	.001000	.000025	.....	.....	
8,000	32,000	.001025	.000025	.....	.....	
8,250	33,000	.001050	.000025	.....	.....	
8,500	34,000	.001075	.000025	.....	.....	
8,750	35,000	.001100	.000025	0.	.....	Elastic limit.
9,000	36,000	.001150	.000050	.....	.....	
9,250	37,000	.001175	.000025	.....	.....	
9,500	38,000	.001225	.005050	.....	.....	
9,750	39,000	.001250	.000025	.....	.....	
10,000	40,000	.001300	.000050	.000025	.000025	
10,250	41,000	.001400	.000100	.....	.....	
10,500	42,000	.001500	.000100	.....	.....	
10,750	43,000	.002750	.001250	.....	.....	
11,000	44,000	.004200	.001450	.....	.....	
11,250	45,000	.005425	.001225	.....	.....	Tensile strength. At time of rupture.
11,500	46,000	.007075	.001650	.....	.....	
12,000	48,000	.009500	.002425	.....	.....	
12,500	50,000	.011275	.001775	.....	.....	
13,000	52,000	.013925	.002650	.....	.....	
13,500	54,000	.016250	.002325	.....	.....	
14,000	56,000	.018950	.002700	.....	.....	
14,500	58,000	.021875	.002925	.....	.....	
15,000	60,000	.025500	.003625	.....	.....	
15,500	62,000	.028500	.003000	.....	.....	
16,000	64,000	.032500	.004000	.....	.....	
16,500	66,000	.036875	.004375	.....	.....	
17,000	68,000	.041875	.005000	.....	.....	
17,500	70,000	.045950	.004075	.....	.....	
18,000	72,000	.0550	.009050	.....	.....	
18,500	74,000	.0625	.0075	.....	.....	
19,000	76,000	.0750	.0125	.....	.....	
19,500	78,000	.1000	.0250	.....	.....	
19,590	78,360	.1300	.1300	.....	.....	
17,500						

*General summary.*

Tensile strength per square inch of original section .....pounds.. 78,360  
 Elastic limit per square inch of original section .....do... 40,000  
 Elongation per inch after rupture.....inch... .1975  
 Elongation per inch under strain at elastic limit.....do... .001300  
 Reduction in diameter at point of rupture .....do... .154  
 Reduction in area after rupture, per centum of original section.....do... 47.2  
 Position of rupture....."1.60 from neck  
 Character of broken surface....silky, irregular, a few bright lines shown which were oblique to the  
 axis of the specimen. Opened cracks in the surface of stem.  
 Elongation of the inch sections.....".14, ".41\*, ".14, ".10

No. 3889.

Marks, <sup>12 R T</sup><sub>B T<sub>3</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000275	.000125	0.	0.	
5,000	20,000	.000825	.000350	0.	0.	
6,250	25,000	.000800	.000175			
7,500	30,000	.001000	.000200	.000025	.000025	
7,750	31,000	.001025	.000025			
8,000	32,000	.001075	.000050			
8,250	33,000	.001175	.000100			Elastic limit.
8,500	34,000	.001275	.000100			
8,750	35,000	.001525	.000250	.000475	.000450	
9,000	36,000	.002500	.000975			
9,250	37,000	.003025	.000525			
9,500	38,000	.003875	.000850			
9,750	39,000	.004800	.000925			
10,000	40,000	.006275	.001475	.004800	.004325	
10,500	42,000	.008250	.001975			
11,000	44,000	.010500	.002250			
11,500	46,000	.013250	.002750			
12,000	48,000	.016125	.002875			
12,500	50,000	.019400	.003275			
13,000	52,000	.022750	.003350			
13,500	54,000	.026375	.003625			
14,000	56,000	.031000	.004625			
14,500	58,000	.035625	.004625			
15,000	60,000	.041500	.005875			
15,500	62,000	.048375	.006875			
16,000	64,000	.0575	.009125			
16,500	66,000	.0700	.0125			
17,000	68,000	.0850	.0150			
17,500	70,000	.1175	.0325			
17,820	71,280	.1950	.0775			Tensile strength.
15,100						At time of rupture.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 71,280  
 Elastic limit per square inch of original section.....do.. 32,000  
 Elongation per inch after rupture.....inch.. .2500  
 Elongation per inch under strain at elastic limit.....do.. .001075  
 Reduction in diameter at point of rupture.....do.. .154  
 Reduction in area after rupture, per centum of original section.....47.2  
 Position of rupture.....1" 50 from neck  
 Character of broken surface, resembles that of B T<sub>1</sub> I, except bright lines are oblique to axis of speci-  
 men.  
 Elongation of inch sections.....".21, ".43, \* ".20, ".16

No. 3890.

Marks, <sup>12</sup> B T  
<sub>B T<sub>4</sub> I</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.		
2,500	10,000	.000250	.000175			
5,000	20,000	.000550	.000300	0.		
6,250	25,000	.000750	.000200			
7,500	30,000	.000975	.000225	0.		
7,750	31,000	.001000	.000025			
8,000	32,000	.001025	.000025			
8,250	33,000	.001050	.000050			
8,500	34,000	.001100	.000050			
8,750	35,000	.001150	.000050	.000050	.000050	Elastic limit.
9,000	36,000	.001200	.000050			
9,250	37,000	.001250	.000050			
9,500	38,000	.001300	.000050			
9,750	39,000	.001400	.000100			
10,000	40,000	.001525	.000125	.000250	.000200	
10,250	41,000	.001675	.000150			
10,500	42,000	.001775	.000100			
10,750	43,000	.001950	.000175			
11,000	44,000	.002275	.000325			
11,250	45,000	.002725	.000450			Tensile strength. At time of rupture.
11,500	46,000	.003675	.000950			
12,000	48,000	.005500	.001825			
12,500	50,000	.008125	.002625			
13,000	52,000	.011000	.002875			
13,500	54,000	.013125	.002125			
14,000	56,000	.015775	.002650			
14,500	58,000	.018750	.002975			
15,000	60,000	.021875	.003125			
15,500	62,000	.025000	.003125			
16,000	64,000	.028750	.003750			Tensile strength. At time of rupture.
16,500	66,000	.033250	.004500			
17,000	68,000	.0375	.004250			
17,500	70,000	.0437	.0062			
18,000	72,000	.0505	.0068			
18,500	74,000	.0625	.0120			
19,000	76,000	.0750	.0125			
19,500	78,000	.1025	.0275			
17,300						

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 78,000  
 Elastic limit per square inch of original section..... do... 38,000  
 Elongation per inch after rupture ..... inch... .1525  
 Elongation per inch under strain at elastic limit..... do... .001300  
 Reduction in diameter at point of rupture ..... do... .144  
 Reduction in area after rupture, per centum of original section ..... do... 44.6  
 Position of rupture ..... ".85 from neck  
 Character of broken surface ..... resembles that of B T<sub>2</sub> O  
 Elongation of inch sections ..... ".30", ".10", ".09", ".12



No. 3891.

Marks, <sup>12 R T</sup><sub>B T<sub>5</sub>O</sub>

Diameter, .564

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000300	.000475	.....	.....	
5,000	20,000	.000625	.000325	0.	.....	
6,250	25,000	.000800	.000175	.....	.....	
7,500	30,000	.000950	.000150	0.	.....	
7,750	31,000	.000975	.000025	.....	.....	
8,000	32,000	.001025	.000050	.....	.....	
8,250	33,000	.001075	.000050	.....	.....	
8,500	34,000	.001100	.000025	.....	.....	
8,750	35,000	.001125	.000025	.000050	.000050	Elastic limit.
9,000	36,000	.001150	.000025	.....	.....	
9,250	37,000	.001175	.000025	.....	.....	
9,500	38,000	.001250	.000075	.....	.....	
9,750	39,000	.001350	.000100	.....	.....	
10,000	40,000	.001425	.000075	.....	.....	
10,250	41,000	.003300	.001875	.....	.....	
10,500	42,000	.005250	.001950	.....	.....	
10,750	43,000	.006175	.000025	.....	.....	
11,000	44,000	.007325	.001150	.....	.....	
11,500	46,000	.009550	.002225	.....	.....	Tensile strength. At time of rupture.
12,000	48,000	.012000	.002450	.....	.....	
12,500	50,000	.014250	.002250	.....	.....	
13,000	52,000	.016875	.002625	.....	.....	
13,500	54,000	.019375	.002500	.....	.....	
14,000	56,000	.022600	.003225	.....	.....	
14,500	58,000	.026000	.003400	.....	.....	
15,000	60,000	.029375	.003375	.....	.....	
15,500	62,000	.033500	.004125	.....	.....	
16,000	64,000	.038000	.004500	.....	.....	
16,500	66,000	.043000	.005000	.....	.....	Tensile strength. At time of rupture.
17,000	68,000	.049625	.006625	.....	.....	
17,500	70,000	.0550	.005375	.....	.....	
18,000	72,000	.0700	.0150	.....	.....	
18,500	74,000	.0850	.0150	.....	.....	
19,000	76,000	.1075	.0225	.....	.....	
19,280	77,120	.1650	.0575	.....	.....	
16,100	.....	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	77,120
Elastic limit per square inch of original section.....	do...	37,000
Elongation per inch after rupture.....	inch.....	.2200
Elongation per inch under strain at elastic limit.....	do...	.001175
Reduction in diameter at point of rupture.....	do...	.154
Reduction in area after rupture, per centum of original section.....	.....	47.2
Position of rupture.....	.....	2".10 from neck
Character of broken surface, granular, 40 per cent.; silky, 60 per cent.; opened cracks in surface of stem	.....	.....
Elongation of inch sections.....	.....	".15 ".42* ".18 ".13

H. Ex. 165—8

No. 3892.

Marks, <sup>12 R T</sup><sub>B T<sub>8</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Elastic limit
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000275	.000175	0.	0.	
5,000	20,000	.000575	.000300	0.	0.	
6,250	25,000	.000750	.000175	0.	0.	
7,500	30,000	.000975	.000225	0.	0.	
7,750	31,000	.001000	.000025	0.	0.	
8,000	32,000	.001050	.000050	0.	0.	
8,250	33,000	.001175	.000125	0.	0.	
8,500	34,000	.001300	.000125	0.	0.	
8,750	35,000	.001775	.000475	0.	0.	Elastic limit.
9,000	36,000	.002825	.001050	0.	0.	
9,250	37,000	.003400	.000575	0.	0.	
9,500	38,000	.004425	.001025	0.	0.	
9,750	39,000	.005500	.001075	0.	0.	
10,000	40,000	.006675	.001175	0.	0.	
10,500	42,000	.008950	.002275	0.	0.	
11,000	44,000	.011500	.002550	0.	0.	
11,500	46,000	.014250	.002750	0.	0.	
12,000	48,000	.017125	.002875	0.	0.	
12,500	50,000	.020750	.003625	0.	0.	Tensile strength. At time of rupture.
13,000	52,000	.024250	.003500	0.	0.	
13,500	54,000	.028375	.004125	0.	0.	
14,000	56,000	.033000	.004625	0.	0.	
14,500	58,000	.038500	.005500	0.	0.	
15,000	60,000	.041575	.006075	0.	0.	
15,500	62,000	.0500	.005425	0.	0.	
16,000	64,000	.0600	.0100	0.	0.	
16,500	66,000	.0750	.0150	0.	0.	
17,000	68,000	.1000	.0250	0.	0.	
17,500	70,000	.1750	.0750	0.	0.	
15,500	70,000	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 70,000  
 Elastic limit per square inch of original section.....do... 32,000  
 Elongation per inch after rupture.....inch... 2790  
 Elongation per inch under strain at elastic limit.....do... .001050  
 Reduction in diameter at point of rupture.....do... .144  
 Reduction in area after rupture, per centum of original section.....44.6  
 Position of rupture.....1".45 from neck  
 Character of broken surface.....silky oblique; bright lines parallel to surface of fracture  
 Elongation of inch sections.....".18, ".24, ".43, ".23

## No. 797.

Marks, <sup>12 R T</sup><sub>B R 7</sub>

Length, 5'".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'".

Applied loads.		Compress- ion per inch.	Successive compress- ion per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000300	.000200	.....	.....	
7,500	15,000	.000433	.000133	.....	.....	
10,000	20,000	.000567	.000134	0.	.....	
12,500	25,000	.000733	.000166	.....	.....	Elastic limit.
15,000	30,000	.000933	.000200	0.	.....	
17,500	35,000	.001133	.000200	.000033	.000033	
18,500	36,000	.001333	.000200	.....	.....	
19,500	37,000	.001500	.000167	.....	.....	
19,000	38,000	.001733	.000233	.....	.....	
19,500	39,000	.002467	.000734	.....	.....	
20,000	40,000	.004667	.002200	.003267	.003234	
20,500	41,000	.005500	.000833	.....	.....	
21,000	42,000	.006267	.000767	.....	.....	
21,500	43,000	.007067	.000800	.....	.....	Ultimate strength.
22,000	44,000	.008067	.001000	.....	.....	
22,500	45,000	.009200	.001133	.....	.....	
34,780	69,560	.....	.....	.....	.....	

Failed by triple flexure.

## No. 798.

Marks, <sup>12 R T</sup><sub>B R<sub>3</sub></sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	.....	.....	
5,000	10,000	.000267	.000134	.....	.....	
7,500	15,000	.000433	.000166	.....	.....	
10,000	20,000	.000567	.000134	0.	.....	
12,500	25,000	.000733	.000166	.....	.....	
15,000	30,000	.000900	.000167	0.	.....	
15,500	31,000	.000933	.000033	.....	.....	
16,000	32,000	.000967	.000037	.....	.....	
16,500	33,000	.001000	.000033	.....	.....	
17,000	34,000	.001067	.000067	.....	.....	Elastic limit.
17,500	35,000	.001167	.000100	.000167	.000167	
18,000	36,000	.001300	.000133	.....	.....	
18,500	37,000	.001533	.000233	.....	.....	
19,000	38,000	.002000	.000467	.....	.....	
19,500	39,000	.002900	.000900	.....	.....	
20,000	40,000	.005000	.002100	.003600	.003433	
20,500	41,000	.005567	.000567	.....	.....	
21,000	42,000	.006467	.000900	.....	.....	
21,500	43,000	.007467	.001000	.....	.....	
22,000	44,000	.008700	.001233	.....	.....	Ultimate strength.
22,500	45,000	.009833	.001133	.008233	.004633	
34,270	68,540	.....	.....	.....	.....	

Failed by triple flexure.

## No. 795.

Marks,  $\frac{12 R T}{B T_9 I}$ .

Length, 12'.

Diameter, 1 $\frac{1}{2}$ .129.

Sectional area, 1 square inch.

Gauged length, 10'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.00011	.00011	.....	.....	
10,000	10,000	.00029	.00018	.....	.....	
15,000	15,000	.00045	.00016	.....	.....	
20,000	20,000	.00061	.00016	0.	.....	
25,000	25,000	.00080	.00019	.....	.....	
28,000	28,000	.00090	.00010	.....	.....	
29,000	29,000	.00093	.00003	.....	.....	
30,000	30,000	.00098	.00005	.00003	.00003	
31,000	31,000	.00101	.00003	.....	.....	Elastic limit.
32,000	32,000	.00107	.00006	.....	.....	
33,000	33,000	.00112	.00005	.....	.....	
34,000	34,000	.00130	.00018	.....	.....	
35,000	35,000	.00135	.00005	.00022	.00019	
36,000	36,000	.00151	.00016	.....	.....	
37,000	37,000	.00170	.00019	.....	.....	
38,000	38,000	.00191	.00021	.....	.....	
39,000	39,000	.00224	.00033	.....	.....	
40,000	40,000	.00271	.00047	.00142	.00120	
41,000	41,000	.00321	.00050	.....	.....	Ultimate strength.
42,000	42,000	.00450	.00129	.....	.....	
43,000	43,000	.00550	.00190	.....	.....	
44,000	44,000	.00725	.00175	.....	.....	
44,200	44,200	.....	.....	.....	.....	

Failed by triple flexure.

No. 796.

Marks, <sup>12 R T</sup><sub>B T<sub>10</sub> O</sub>

Length, 12".

Diameter, 1" .129.

Sectional area, 1.00 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.00011	.00011	-----	-----	
10,000	10,000	.00029	.00018	-----	-----	
15,000	15,000	.00044	.00015	-----	-----	
20,000	20,000	.00061	.00017	0.	-----	
25,000	25,000	.00080	.00019	-----	-----	
28,000	28,000	.00091	.00011	-----	-----	
29,000	29,000	.00093	.00002	-----	-----	
30,000	30,000	.00099	.00006	.00002	.00002	
31,000	31,000	.00102	.00003	-----	-----	
32,000	32,000	.00108	.00006	-----	-----	Elastic limit.
33,000	33,000	.00111	.00003	-----	-----	
34,000	34,000	.00119	.00008	-----	-----	
35,000	35,000	.00128	.00009	.00017	.00015	
36,000	36,000	.00165	.00037	-----	-----	
37,000	37,000	.00201	.00036	-----	-----	
38,000	38,000	.00240	.00039	-----	-----	
39,000	39,000	.00300	.00060	-----	-----	
40,000	40,000	.00410	.0010	.00271	.00254	
46,470	46,470	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

No. 799.

Marks, <sup>12 R T</sup><sub>B T, I</sub>

Length, 5'".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'".

Applied loads.		Compression.	Successive compression.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	.....	.....	
5,000	10,000	.000267	.000134	.....	.....	
7,500	15,000	.000400	.000133	.....	.....	
10,000	20,000	.000533	.000133	0.	.....	
12,500	25,000	.000700	.000167	0.	.....	
15,000	30,000	.000900	.000200	.....	.....	
15,500	31,000	.000933	.000033	.....	.....	
16,000	32,000	.000967	.000034	.....	.....	
16,500	33,000	.001033	.000066	.....	.....	
17,000	34,000	.001067	.000034	.....	.....	
17,500	35,000	.001100	.000033	.....	.....	
18,000	36,000	.001133	.000033	.....	.....	
18,500	37,000	.001133	0.	.....	.....	
19,000	38,000	.001100	-.000033	.....	.....	
19,500	39,000	.000967	-.000133	.....	.....	Elastic limit; defects convex on micrometer side of specimen.
20,000	40,000	.000833	-.000134	-.000667	-.000667	
20,500	41,000	.000633	-.000200	.....	.....	Deflection proceeds rapidly.
21,000	42,000	.000633	0.	.....	.....	
21,500	43,000	.000500	-.000133	.....	.....	
22,000	44,000	.000500	0.	.....	.....	
22,500	45,000	.000833	.000333	-.000767	-.000100	
23,000	46,000	.001067	.000234	.....	.....	
23,500	47,000	.001467	.000400	.....	.....	
24,000	48,000	.001667	.000200	.....	.....	
24,500	49,000	.001833	.000166	.....	.....	
25,000	50,000	.001867	.000034	+.000133	.000900	
32,900	65,800	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## No. 800.

Marks,  $\begin{smallmatrix} 12 R T \\ B T_{12} O \end{smallmatrix}$ 

Length, "5.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

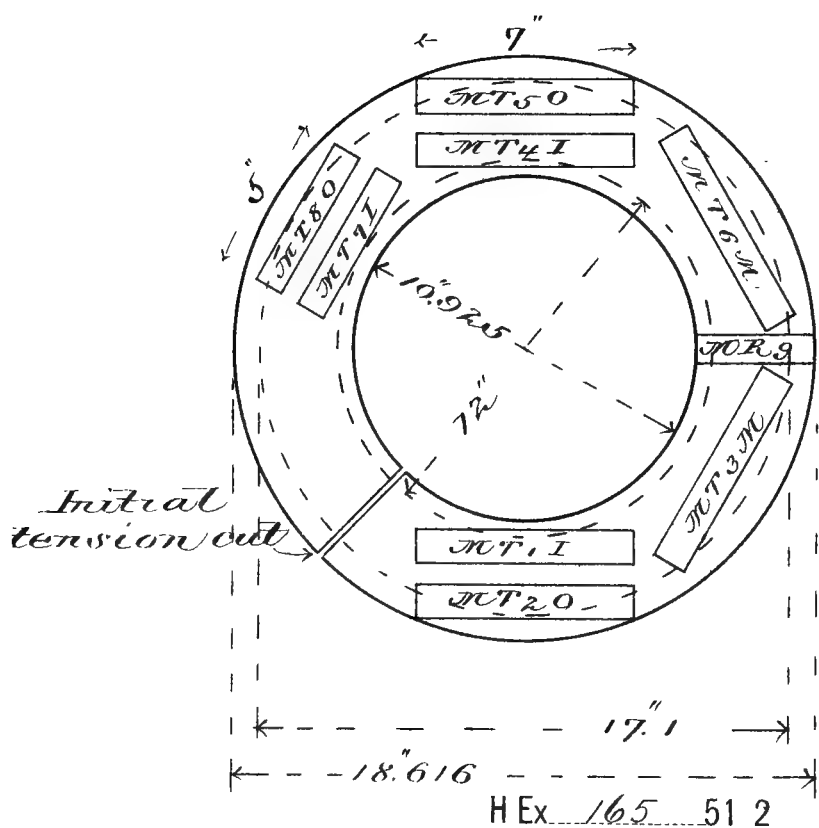
Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	1,000	0.	0.	0.	0.	
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000233	.000133	.....	.....	
7,500	15,000	.000400	.000167	.....	.....	
10,000	20,000	.000533	.000133	0.	.....	
12,500	25,000	.000733	.000200	.....	.....	
15,000	30,000	.000933	.000209	.000033	.000033	
15,500	31,000	.000967	.000034	.....	.....	
16,000	32,000	.001000	.000033	.....	.....	Elastic limit.
16,500	33,000	.001033	.000033	.....	.....	
17,000	34,000	.001100	.000067	.....	.....	
17,500	35,000	.001200	.000100	.000133	.000100	
18,000	36,000	.001333	.000133	.....	.....	
18,500	37,000	.001500	.000167	.....	.....	
19,000	38,000	.001500	.000300	.....	.....	
19,500	39,000	.002533	.000733	.....	.....	
20,000	40,000	.003367	.000834	.001500	.000167	
20,500	41,000	.004000	.000633	.....	.....	Ultimate strength.
21,000	42,000	.004333	.000933	.....	.....	
21,500	43,000	.006200	.001267	.....	.....	
22,000	44,000	.007333	.001133	.....	.....	
22,500	45,000	.008600	.001267	.006800	.005300	
35,480	70,960	.....	.....	.....	.....	

Failed by triple flexure.



# 12-inch B. L. Rifle

## Muzzle end of Tube





## MUZZLE END.

No. 3893.

Marks, <sup>12 R T</sup><sub>M T, I</sub>Diameter, <sup>11</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000275	.000175	0.	0.	
5,000	20,000	.000600	.000325	0.	0.	
6,250	25,000	.000775	.000175	0.	0.	
7,500	30,000	.000975	.000200	0.	0.	
8,750	35,000	.001175	.000200	0.	0.	
9,000	36,000	.001200	.000025	0.	0.	
9,250	37,000	.001250	.000025	0.	0.	
9,500	38,000	.001275	.000050	0.	0.	Elastic limit.
9,750	39,000	.001300	.000025	0.	0.	
10,000	40,000	.001350	.000050	0.	0.	
10,250	41,000	.001400	.000050	0.	0.	
10,500	42,000	.001425	.000025	0.	0.	
10,750	43,000	.001475	.000050	0.	0.	
11,000	44,000	.001500	.000025	0.	0.	
11,250	45,000	.001525	.000025	0.	0.	
11,500	46,000	.002550	.001025	0.	0.	
11,750	47,000	.003500	.000950	0.	0.	Tensile strength. At time of rupture.
12,000	48,000	.005200	.001700	0.	0.	
12,250	49,000	.006250	.001050	0.	0.	
12,500	50,000	.006750	.000500	0.	0.	
13,000	52,000	.008250	.001500	0.	0.	
13,500	54,000	.010125	.001875	0.	0.	
14,000	56,000	.012875	.001750	0.	0.	
14,500	58,000	.013750	.001875	0.	0.	
15,000	60,000	.015625	.001875	0.	0.	
15,500	62,000	.017500	.001875	0.	0.	
16,000	64,000	.018750	.002250	0.	0.	Tensile strength. At time of rupture.
16,500	66,000	.022375	.002625	0.	0.	
17,000	68,000	.024875	.002500	0.	0.	
17,500	70,000	.027425	.002550	0.	0.	
18,000	72,000	.031000	.003575	0.	0.	
18,500	74,000	.034000	.003000	0.	0.	
19,000	76,000	.038125	.004125	0.	0.	
19,500	78,000	.0425	.004375	0.	0.	
20,000	80,000	.0475	.0050	0.	0.	
20,500	82,000	.0525	.0050	0.	0.	
21,000	84,000	.0650	.0125	0.	0.	Tensile strength. At time of rupture.
21,500	86,000	.0750	.0100	0.	0.	
22,000	88,000	.0900	.0150	0.	0.	
22,500	90,000	.1325	.0425	0.	0.	
20,800						

## General summary.

Tensile strength per square inch of original section ..... pounds.. 90,000  
 Elastic limit per square inch of original section ..... do... 45,000  
 Elongation per inch after rupture ..... inch... .1700  
 Elongation per inch under strain at elastic limit ..... do... .001525  
 Reduction in diameter at point of rupture ..... do... .114  
 Reduction in area after rupture, per centum of original section ..... 36.4  
 Position of rupture ..... 1".60 from neck  
 Character of broken surface ..... silky, oblique  
 Elongation of inch sections ..... ".11, ".13, ".31", ".13

No. 3894.

Marks, <sup>12 R T</sup><sub>M T<sub>2</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000275	.000175	0.	0.	
5,000	20,000	.000575	.000300	0.	0.	
7,500	30,000	.000950	.000375	0.	0.	
8,750	35,000	.001100	.000150	0.	0.	
10,000	40,000	.001250	.000150	0.	0.	
10,250	41,000	.001275	.000025	0.	0.	
10,500	42,000	.001325	.000050	0.	0.	
10,750	43,000	.001350	.000025	0.	0.	
11,000	44,000	.001425	.000075	0.	0.	Elastic limit.
11,250	45,000	.001475	.000050	0.	0.	
11,500	46,000	.002250	.000775	0.	0.	
11,750	47,000	.002450	.000200	0.	0.	
12,000	48,000	.003700	.001250	0.	0.	
12,250	49,000	.004950	.001250	0.	0.	
12,500	50,000	.006000	.001050	0.	0.	
13,000	52,000	.007500	.001500	0.	0.	
13,500	54,000	.009125	.001625	0.	0.	
14,000	56,000	.011000	.001875	0.	0.	
14,500	58,000	.013125	.002125	0.	0.	Tensile strength. At time of rupture.
15,000	60,000	.015000	.001875	0.	0.	
15,500	62,000	.017000	.002000	0.	0.	
16,000	64,000	.019375	.002375	0.	0.	
16,500	66,000	.022250	.002875	0.	0.	
17,000	68,000	.024625	.002375	0.	0.	
17,500	70,000	.028000	.003375	0.	0.	
18,000	72,000	.031000	.003000	0.	0.	
18,500	74,000	.034375	.003375	0.	0.	
19,000	76,000	.038375	.004000	0.	0.	
19,500	78,000	.043000	.004625	0.	0.	Tensile strength. At time of rupture.
20,000	80,000	.0475	.0045	0.	0.	
20,500	82,000	.0525	.0050	0.	0.	
21,000	84,000	.0625	.0100	0.	0.	
21,500	86,000	.0775	.0150	0.	0.	
22,000	88,000	.0975	.0200	0.	0.	
22,180	88,720	.1350	.0375	0.	0.	
18,900						

## General summary.

Tensile strength per square inch of original section.....	pounds..	88,720
Elastic limit per square inch of original section.....	do.	45,000
Elongation per inch after rupture.....	inch..	.1750
Elongation per inch under strain at elastic limit.....	do.	.001475
Reduction in diameter at point of rupture.....	do.	.154
Reduction in area after rupture, per centum of original section.....	do.	47.2

No. 3895.

Marks, <sup>12 R T</sup><sub>M T, M</sub>Diameter, <sup>1</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	.....	0.	0.	Initial load.
1,250	5,000	.000100	.....	.....	.....	
2,500	10,000	.000275	.....	.....	.....	
5,000	20,000	.000375	.....	.....	.....	
7,500	30,000	.000950	.....	.....	.....	
8,750	35,000	.001100	.....	.....	.....	
10,000	40,000	.001300	.....	.....	.....	
10,250	41,000	.001325	.....	.....	.....	
10,500	42,000	.001350	.....	.....	.....	
10,750	43,000	.001400	.....	.....	.....	
11,000	44,000	.001450	.....	.....	.....	
11,250	45,000	.001475	.....	.....	.....	Elastic limit.
11,500	46,000	.001525	.....	.....	.....	
		.002250	.....	.....	.....	
11,750	47,000	.003500	.001250	.....	.....	
12,000	48,000	.005450	.001950	.....	.....	
12,250	49,000	.006150	.000700	.....	.....	
12,500	50,000	.006975	.000825	.....	.....	
13,000	52,000	.008500	.001525	.....	.....	
13,500	54,000	.010000	.001500	.....	.....	
14,000	56,000	.011875	.001875	.....	.....	
14,500	58,000	.014400	.002525	.....	.....	
15,000	60,000	.015950	.001550	.....	.....	
15,500	62,000	.018000	.002050	.....	.....	
16,000	64,000	.020625	.002625	.....	.....	
16,500	66,000	.023000	.002375	.....	.....	
17,000	68,000	.025950	.002950	.....	.....	
17,500	70,000	.028775	.002825	.....	.....	
18,000	72,000	.032000	.003225	.....	.....	
18,500	74,000	.036000	.004000	.....	.....	
19,000	76,000	.040000	.004000	.....	.....	Tensile strength. At time of fracture.
19,500	78,000	.043750	.003750	.....	.....	
20,000	80,000	.0500	.006250	.....	.....	
20,500	82,000	.0575	.0075	.....	.....	
21,000	84,000	.0675	.0100	.....	.....	
21,500	86,000	.0800	.0125	.....	.....	
22,000	88,000	.1050	.0250	.....	.....	
22,100	88,400	.1275	.0225	.....	.....	
20,500	.....	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 88,400  
 Elastic limit per square inch of original section.....do... 46,000  
 Elongation per inch after rupture.....inch... 0.1725  
 Elongation per inch under strain at elastic limit.....do... .001525  
 Reduction in diameter at point of rupture.....do... .124  
 Reduction in area after rupture, per centum of original section.....do... 39.2  
 Position of rupture....."110 from neck  
 Character of broken surface.....silky; oblique  
 Elongation of inch sections.....".09, ".11, ".22, ".27"

No. 3896.

Marks, <sup>12 R T</sup>  
<sup>M T<sub>1</sub> I</sup>Diameter, <sup>1</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.	0.	
2,500	10,000	.000275	.000200	0.	0.	
5,000	20,000	.000575	.000300	0.	0.	
7,500	30,000	.000925	.000350	0.	0.	
8,750	35,000	.001075	.000150	0.	0.	
10,000	40,000	.001275	.000200	0.	0.	
10,250	41,000	.001300	.000025	0.	0.	
10,500	42,000	.001325	.000025	0.	0.	
10,750	43,000	.000375	.000050	0.	0.	
11,000	44,000	.001400	.000025	0.	0.	Elastic limit.
11,250	45,000	.001450	.000050	0.	0.	
11,500	46,000	.001500	.000050	0.	0.	
11,750	47,000	.001575	.000075	0.	0.	
12,000	48,000	.001600	.000025	0.	0.	
12,250	49,000	.005250	.003650	0.	0.	
12,500	50,000	.005625	.000375	0.	0.	
12,750	51,000	.006225	.000600	0.	0.	
13,000	52,000	.006975	.000750	0.	0.	
13,250	53,000	.007500	.000525	0.	0.	
13,500	54,000	.008450	.000950	0.	0.	
14,000	56,000	.010250	.001800	0.	0.	
14,500	58,000	.012000	.001750	0.	0.	
15,000	60,000	.013925	.001925	0.	0.	
15,500	62,000	.015625	.001700	0.	0.	
16,000	64,000	.017925	.002300	0.	0.	
16,500	66,000	.020000	.002075	0.	0.	
17,000	68,000	.022500	.002500	0.	0.	
17,500	70,000	.025000	.002500	0.	0.	
18,000	72,000	.027500	.002500	0.	0.	
18,500	74,000	.030500	.003000	0.	0.	
19,000	76,000	.033950	.003450	0.	0.	
19,500	78,000	.037625	.003675	0.	0.	
20,000	80,000	.041500	.003875	0.	0.	
20,500	82,000	.0475	.0060	0.	0.	
21,000	84,000	.0500	.0025	0.	0.	
21,500	86,000	.0575	.0075	0.	0.	
22,000	88,000	.0700	.0125	0.	0.	
22,500	90,000	.0875	.0175	0.	0.	
23,000	92,000	.1250	.0375	0.	0.	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 92,000  
 Elastic limit per square inch of original section.....do... 48,000  
 Elongation per inch after rupture.....inch... .1525  
 Elongation per inch under strain at elastic limit.....do... .001600  
 Reduction in diameter at point of rupture.....do... .084

No. 3897.

Marks, <sup>12 R T</sup><sub>M T<sub>2</sub> O</sub>Diameter, <sup>7</sup>/<sub>16</sub> .564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000100	.000100	0.	.....	
2, 500	10, 000	.000300	.000200	.....	.....	
5, 000	20, 000	.000625	.000325	0.	.....	
7, 500	30, 000	.000975	.000350	0.	.....	
8, 750	35, 000	.001125	.000150	0.	.....	
10, 000	40, 000	.001350	.000225	.000050	.000050	
10, 250	41, 000	.001375	.000025	.....	.....	
10, 500	42, 000	.001400	.000025	.....	.....	
10, 750	43, 000	.001425	.000025	.....	.....	
11, 000	44, 000	.001475	.000050	.....	.....	
11, 250	45, 000	.001500	.000025	.....	.....	
11, 500	46, 000	.001550	.000050	.....	.....	Elastic limit.
11, 750	47, 000	.002125	.000550	.....	.....	
12, 000	48, 000	.003750	.001625	.....	.....	
12, 250	49, 000	.004875	.001125	.....	.....	
12, 500	50, 000	.005950	.001075	.....	.....	
13, 000	52, 000	.007500	.001550	.....	.....	
13, 500	54, 000	.009250	.001750	.....	.....	
14, 000	56, 000	.011000	.001750	.....	.....	
14, 500	58, 000	.012925	.001925	.....	.....	
15, 000	60, 000	.014875	.001950	.....	.....	
15, 500	62, 000	.016950	.002075	.....	.....	
16, 000	64, 000	.019250	.002300	.....	.....	
16, 500	66, 000	.021625	.002375	.....	.....	
17, 000	68, 000	.024500	.002875	.....	.....	
17, 500	70, 000	.027025	.002525	.....	.....	
18, 000	72, 000	.030375	.003350	.....	.....	
18, 500	74, 000	.033650	.003275	.....	.....	
19, 000	76, 000	.0375	.003850	.....	.....	
19, 500	78, 000	.0425	.0050	.....	.....	
20, 000	80, 000	.0475	.0050	.....	.....	
20, 500	82, 000	.0525	.0050	.....	.....	
21, 000	84, 000	.0600	.0075	.....	.....	
21, 500	86, 000	.0725	.0125	.....	.....	
22, 000	88, 000	.0900	.0175	.....	.....	Tensile strength. At time of fracture.
22, 500	90, 000	.1300	.0400	.....	.....	
21, 500	.....	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section..... pounds.. 90,000  
 Elastic limit per square inch of original section..... do... 46,000  
 Elongation per inch after rupture..... inch... .1725  
 Elongation per inch under strain at elastic limit..... do... .001550  
 Reduction in diameter at point of rupture..... do... .094  
 Reduction in area after rupture, per centum of original section..... 30.6  
 Position of rupture..... 1".60 from neck  
 Character of broken surface..... silky oblique  
 Elongation of inch sections..... ".18, ".28, ".13, ".1

No. 3898

Marks, <sup>12 R T</sup><sub>M T<sub>6</sub> M</sub>Diameter, <sup>12 R T</sup><sub>M T<sub>6</sub> M</sub> .564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0	
1,250	5,000	.000125	.000125	0.	-----	
2,500	10,000	.000325	.000200	-----	-----	
5,000	20,000	.000650	.000325	0.	-----	
7,500	30,000	.001000	.000350	.000025	.000025	
8,750	35,000	.001175	.000175	.000050	.000025	
10,000	40,000	.001425	.000250	.000050	0.	
10,250	41,000	.001450	.000025	-----	-----	
10,500	42,000	.001475	.000025	-----	-----	
10,750	43,000	.001500	.000025	-----	-----	Elastic limit.
11,000	44,000	.001525	.000025	-----	-----	
11,250	45,000	.001550	.000025	-----	-----	
11,500	46,000	.001600	.000050	-----	-----	
11,750	47,000	.001650	.000050	-----	-----	
12,000	48,000	.002850	.000200	-----	-----	
12,250	49,000	.003250	.000400	-----	-----	
12,500	50,000	.004375	.001125	-----	-----	
13,000	52,000	.006225	.001850	-----	-----	
13,500	54,000	.007625	.001400	-----	-----	
14,000	56,000	.009500	.001875	.007300	.007250	
14,500	58,000	.010350	.000850	-----	-----	
15,000	60,000	.012675	.002325	.010450	.002950	
15,500	62,000	.014125	.001450	-----	-----	
16,000	64,000	.016300	.002175	-----	-----	
16,500	66,000	.018400	.002100	-----	-----	
17,000	68,000	.020750	.002350	-----	-----	
17,500	70,000	.023550	.002800	-----	-----	
18,000	72,000	.026000	.002450	-----	-----	
18,500	74,000	.028375	.002375	-----	-----	
19,000	76,000	.032000	.003625	-----	-----	
19,500	78,000	.0350	.0030	-----	-----	
20,000	80,000	.0400	.0050	-----	-----	
20,500	82,000	.0425	.0025	-----	-----	
21,000	84,000	.0475	.0050	-----	-----	
21,500	86,000	.0525	.0050	-----	-----	
22,000	88,000	.0625	.0100	-----	-----	
22,500	90,000	.0750	.0125	-----	-----	Tensile strength. At time of rupture.
22,980	91,920	.1000	.0250	-----	-----	
23,100				-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 91,920  
 Elastic limit per square inch of original section ..... do... 47,000  
 Elongation per inch after rupture ..... inch... .1125  
 Elongation per inch under strain at elastic limit ..... do... .001650  
 Reduction in diameter at point of rupture ..... do... .0024



## No. 801.

Marks, <sup>12 R T</sup><sub>M T, I</sub>

Length, 5'".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	1,000	0.	0.	0.	0.	
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000233	.000133	.....	.....	
7,500	15,000	.000400	.000167	.....	.....	
10,000	20,000	.000533	.000133	0.	.....	
12,500	25,000	.000700	.000167	.....	.....	
15,000	30,000	.000933	.000233	0.	.....	
17,500	35,000	.001100	.000167	.....	.....	
20,000	40,000	.001367	.000167	.000067	.000067	
20,500	41,000	.001333	.000066	.....	.....	
21,000	42,000	.001367	.000034	.....	.....	
21,500	43,000	.001267	0.	.....	.....	
22,000	44,000	.001433	.000066	.....	.....	
22,500	45,000	.001467	.000034	.....	.....	
23,000	46,000	.001500	.000033	.....	.....	Elastic limit.
23,500	47,000	.001533	.000033	.....	.....	
24,000	48,000	.002800	.001267	.....	.....	
24,500	49,000	.004500	.001700	.....	.....	
25,000	50,000	.004667	.000167	.....	.....	
25,500	51,000	.005033	.000366	.....	.....	
26,000	52,000	.005667	.000634	.....	.....	
26,500	53,000	.006267	.000600	.....	.....	
27,000	54,000	.006733	.000466	.....	.....	
27,500	55,000	.007400	.000667	.....	.....	
28,000	56,000	.007833	.000433	.....	.....	Ultimate strength.
41,300	82,600	.....	.....	.....	.....	

Failed by triple flexure.

No. 802.

Marks,  $12 \frac{RT}{MT_3O}$ 

Length, 5'.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	1,000	0.	0.	0.	0.	
2,500	5,000	.000133	.000133	-----	-----	
5,000	10,000	.000267	.000134	-----	-----	
7,500	15,000	.000400	.000133	-----	-----	
10,000	20,000	.000567	.000167	0.	-----	
12,500	25,000	.000733	.000166	-----	-----	
15,000	30,000	.000900	.000167	0.	-----	
17,500	35,000	.001067	.000167	-----	-----	
20,000	40,000	.001233	.000166	0.	-----	
20,500	41,000	.001267	.000034	-----	-----	
21,000	42,000	.001333	.000066	-----	-----	
21,500	43,000	.001367	.000034	-----	-----	
22,000	44,000	.001400	.000033	-----	-----	
22,500	45,000	.001467	.000067	-----	-----	
22,000	46,000	.001533	.000066	-----	-----	
23,500	47,000	.001600	.000067	-----	-----	
24,000	48,000	.001667	.000067	-----	-----	
24,500	49,000	.001767	.000100	-----	-----	Elastic limit.
25,000	50,000	.001967	.000200	-----	-----	
25,500	51,000	.004300	.002333	-----	-----	
26,000	52,000	.005533	.001233	-----	-----	
26,500	53,000	.006600	.001067	-----	-----	Ultimate strength.
27,000	54,000	.007333	.000733	-----	-----	
42,410	84,820	-----	-----	-----	-----	

Failed by triple flexure.

No. 803.

Marks, <sup>12 R T</sup><sub>M R<sub>0</sub></sub>

Length, 3'' .80.

Diameter, '' .798.

Sectional area, .50 square inch.

Gauged length, 3''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000233	.000133	.....	.....	
7,500	15,000	.000376	.000134	.....	.....	
10,000	20,000	.000500	.000133	0.	.....	
12,500	25,000	.000667	.000176	.....	.....	
15,000	30,000	.000833	.000266	0.	.....	
17,500	35,000	.001067	.000134	.....	.....	
20,000	40,000	.001233	.000166	0.	.....	
20,500	41,000	.001233	0.	.....	.....	
21,000	42,000	.001267	.000034	.....	.....	
21,500	43,000	.001300	.000033	.....	.....	Elastic limit.
22,000	44,000	.001333	.001033	.....	.....	
22,500	45,000	.002867	.000534	.....	.....	
23,000	46,000	.003400	.000533	.....	.....	
23,500	47,000	.004033	.000633	.....	.....	
24,000	48,000	.004633	.000600	.....	.....	
24,500	49,000	.005300	.000667	.....	.....	
25,000	50,000	.005900	.000600	.....	.....	
45,580	91,180	.....	.....	.....	.....	Ultimate strength.

Failed by double flexure.

H. Ex. 165—9

## SPECIMENS FROM JACKET.

REAR END.

No. 3903.

Marks, <sup>12 R J</sup><sub>B T I</sub>Diameter, <sup>1</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000275	.000275	0.	0.	
5,000	20,000	.000550	.000550	0.	0.	
7,500	30,000	.000925	.000925	0.	0.	
8,750	35,000	.001050	.001050	0.	0.	
9,500	38,000	.001125	.001125	0.	0.	
9,750	39,000	.001175	.001175	0.	0.	
10,000	40,000	.002250	.001075	.000825	.000825	
10,250	41,000	.002475	.002225	0.	0.	Elastic limit.
10,500	42,000	.002675	.002000	.001250	.000425	
10,750	43,000	.003000	.000325	0.	0.	
11,000	44,000	.003425	.000425	0.	0.	
11,250	45,000	.004000	.000575	0.	0.	
11,500	46,000	.004900	.000900	0.	0.	
12,000	48,000	.006425	.001525	0.	0.	
12,500	50,000	.008275	.001850	0.	0.	
13,000	52,000	.010300	.002025	0.	0.	
13,500	54,000	.012250	.001950	0.	0.	
14,000	56,000	.014450	.002200	0.	0.	Tensile strength.
14,500	58,000	.016625	.002175	0.	0.	
15,000	60,000	.018925	.002300	0.	0.	
15,500	62,000	.021500	.002575	0.	0.	
16,000	64,000	.024125	.002625	0.	0.	
16,500	66,000	.027500	.003375	0.	0.	
17,000	68,000	.030500	.003900	0.	0.	
17,500	70,000	.034000	.003500	0.	0.	
18,000	72,000	.038500	.004500	0.	0.	
18,500	74,000	.043000	.004500	0.	0.	
19,000	76,000	.0500	.0070	0.	0.	Tensile strength.
19,500	78,000	.0537	.0037	0.	0.	
20,000	80,000	.0650	.0113	0.	0.	
20,500	82,000	.0750	.0100	0.	0.	
21,000	84,000	.0975	.0225	0.	0.	
21,290	85,160	.1450	.0475	0.	0.	

## General summary.

Tensile strength per square inch of original section .....	pounds..	85,160
Elastic limit per square inch of original section .....	do...	39,000
Elongation per inch after rupture .....	inch..	.1800
Elongation per inch under strain at elastic limit .....	do...	.001175
Reduction in diameter at point of rupture .....	do...	.084
Reduction in area after rupture, per centum of original section .....	do...	27.6
Position of rupture .....	1" from neck	
Character of broken surface.....	silky, 40 per cent.; granular, 60 per cent.; opened cracks in surface of stem in vicinity of fracture.	
Elongation of inch sections .....	".19", ".24", ".15", ".14	

*12-inch B. L. Rifle*

*Rear end of Jacket.*



HEx 165 51 2



No. 3904.

Marks, <sup>12 R J</sup><sub>B T O</sub>Diameter, <sup>7</sup>/<sub>16</sub> .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000175	.000175	0.	0.	
2,500	10,000	.000350	.000175	0.	0.	
5,000	20,000	.000650	.000300	0.	0.	
7,500	30,000	.001000	.000350	0.	0.	
8,750	35,000	.001175	.000175	.000050	.000050	
10,000	40,000	.001375	.000200	0.	0.	
10,500	42,000	.001400	.000025	.000050	0.	
10,750	43,000	.001425	.000025	0.	0.	
11,000	44,000	.001475	.000050	0.	0.	
11,250	45,000	.001550	.000075	0.	0.	
11,500	46,000	.001600	.000050	0.	0.	
11,750	47,000	.001625	.000025	0.	0.	
12,000	48,000	.001675	.000050	0.	0.	
12,250	49,000	.001700	.000025	0.	0.	Elastic limit.
12,500	50,000	.001800	.000100	0.	0.	
12,750	51,000	.001875	.000075	0.	0.	
13,000	52,000	.002125	.000250	0.	0.	
13,250	53,000	.003625	.001500	0.	0.	
13,500	54,000	.004625	.001000	0.	0.	
13,750	55,000	.005500	.000875	0.	0.	
14,000	56,000	.006250	.000750	0.	0.	
14,500	58,000	.007500	.001550	0.	0.	
15,000	60,000	.009250	.001450	0.	0.	
15,500	62,000	.011000	.001750	0.	0.	
16,000	64,000	.012750	.001750	0.	0.	
16,500	66,000	.014500	.001750	0.	0.	
17,000	68,000	.016275	.001775	0.	0.	
17,500	70,000	.018250	.001975	0.	0.	
18,000	72,000	.020250	.002000	0.	0.	
18,500	74,000	.022500	.003250	0.	0.	
19,000	76,000	.025000	.002500	0.	0.	
19,500	78,000	.027000	.002000	0.	0.	
20,000	80,000	.029750	.002750	0.	0.	
20,500	82,000	.033000	.003250	0.	0.	
21,000	84,000	.036000	.003000	0.	0.	
21,500	86,000	.040000	.004000	0.	0.	
22,000	88,000	.0450	.0050	0.	0.	
22,500	90,000	.0500	.0050	0.	0.	
23,000	92,000	.0550	.0050	0.	0.	
23,500	94,000	.0650	.0100	0.	0.	
24,000	96,000	.0750	.0100	0.	0.	
24,500	98,000	.0950	.0200	0.	0.	Tensile strength.
24,710	98,840	.1275	.0325	0.	0.	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 98,840  
 Elastic limit per square inch of original section.....do... 49,000  
 Elongation per inch after rupture.....inch... .1600  
 Elongation per inch under strain at elastic limit.....do... .601700  
 Reduction in diameter at point of rupture.....do... .084  
 Reduction in area after rupture, per centum of original section.....27.6  
 Position of rupture.....1" .60 from neck  
 Character of broken surface.....granular; dull silky band extending from circumference to center  
 Elongation of inch sections.....".11, ".14, ".28, ".11

No. 3905.

Marks, <sup>12 R J</sup><sub>B T<sub>3</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000100	.000100	0.	.....	
2, 500	10, 000	.000300	.000200	.....	.....	
5, 000	20, 000	.000600	.000300	.....	.....	
7, 500	30, 000	.001000	.000400	.....	.....	
8, 750	35, 000	.001225	.000225	.000050	.000050	Elastic limit.
9, 000	36, 000	.001325	.000100	.....	.....	
9, 250	37, 000	.001400	.000075	.....	.....	
9, 500	38, 000	.001550	.000150	.....	.....	
9, 750	39, 000	.001775	.000225	.....	.....	
10, 000	40, 000	.002325	.000550	.....	.....	
10, 250	41, 000	.002825	.000500	.....	.....	
10, 500	42, 000	.003775	.000950	.002300	.002250	
10, 750	43, 000	.004250	.000475	.....	.....	
11, 000	44, 000	.005125	.000875	.....	.....	
11, 500	46, 000	.006750	.001625	.....	.....	
12, 000	48, 000	.008625	.001875	.....	.....	
12, 500	50, 000	.010500	.001875	.....	.....	
13, 000	52, 000	.012500	.002000	.....	.....	
13, 500	54, 000	.014750	.002250	.....	.....	
14, 000	56, 000	.016875	.002125	.....	.....	
14, 500	58, 000	.019500	.002625	.....	.....	
15, 000	60, 000	.022250	.002750	.....	.....	
15, 500	62, 000	.025000	.002750	.....	.....	
16, 000	64, 000	.028125	.003125	.....	.....	
16, 500	66, 000	.031750	.003625	.....	.....	
17, 000	68, 000	.035500	.003750	.....	.....	
17, 500	70, 000	.040000	.004500	.....	.....	
18, 000	72, 000	.0450	.0050	.....	.....	
18, 500	74, 000	.0500	.0050	.....	.....	
19, 000	76, 000	.0575	.0075	.....	.....	
19, 500	78, 000	.0700	.0125	.....	.....	
20, 000	80, 000	.0800	.0100	.....	.....	
20, 500	82, 000	.0950	.0150	.....	.....	
20, 640	82, 560	.1500	.0550	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 82, 560  
 Elastic limit per square inch of original section ..... do... 35, 000  
 Elongation per inch after rupture ..... inch... .1650  
 Elongation per inch under strain at elastic limit ..... do... .001225  
 Reduction in diameter at point of rupture ..... do... .084  
 Reduction in area after rupture, per centum of original section ..... 27.6  
 Position of rupture ..... 2". 15 from neck  
 Character of broken surface ..... granular, 50 per cent.; dull silky, 50 per cent  
 Elongation of inch sections ..... ".12, ".26, ".16, ".12



## No. 804.

Marks, <sup>12 RJ</sup><sub>B T I</sub>

Length, 5'".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000167	.000167	.....	.....	
5,000	10,000	.000300	.000133	.....	.....	
7,500	15,000	.000500	.000200	.....	.....	
10,000	20,000	.000633	.000133	.....	.....	
12,500	25,000	.000800	.000167	.....	.....	
15,000	30,000	.000933	.000133	0.	.....	
17,500	35,000	.001100	.000167	.....	.....	
19,000	38,000	.001200	.000100	.....	.....	
19,500	39,000	.001233	.000033	.....	.....	
20,000	40,000	.001300	.000067	0.	.....	Elastic limit.
20,500	41,000	.001333	.000033	.....	.....	
21,000	42,000	.001367	.000034	.....	.....	
21,500	43,000	.001400	.000033	.....	.....	
22,000	44,000	.001433	.000033	.....	.....	
22,500	45,000	.001600	.000167	.....	.....	
23,000	46,000	.001833	.000233	.....	.....	
23,500	47,000	.002967	.001134	.....	.....	
24,000	48,000	.005167	.002200	.....	.....	
24,500	49,000	.006000	.000833	.....	.....	Ultimate strength.
25,000	50,000	.006733	.000733	.....	.....	
39,910	79,820	.....	.....	.....	.....	

Failed by triple flexure.

No. 805.

Marks,  $12 R J$   
 $B T_5 0$ 

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch. *</i>	Initial load.
500	1,000	0.000133	0.000133	0.	0.	
2,500	5,000	.000300	.000167	.....	.....	
5,000	10,000	.000467	.000167	.....	.....	
7,500	15,000	.000633	.000166	.....	.....	
10,000	20,000	.000767	.000134	.....	.....	
12,500	25,000	.000933	.000166	.....	.....	
15,000	30,000	.001100	.000167	.....	.....	
17,500	35,000	.001200	.000100	.....	.....	
19,000	38,000	.001233	.000033	.....	.....	
19,500	39,000	.001300	.000067	.....	.....	
20,000	40,000	.001333	.000033	.....	.....	
20,500	41,000	.001367	.000034	.....	.....	
21,000	42,000	.001400	.000033	.....	.....	
21,500	43,000	.001433	.000033	.....	.....	
22,000	44,000	.001500	.000067	.....	.....	
22,500	45,000	.001567	.000067	.....	.....	
23,000	46,000	.001667	.000100	.....	.....	Elastic limit.
23,500	47,000	.001767	.000100	.....	.....	
24,000	48,000	.001933	.000166	.....	.....	
24,500	49,000	.002200	.000267	.....	.....	
25,000	50,000	.002433	.000233	.....	.....	
25,500	51,000	.002767	.000334	.....	.....	
26,000	52,000	.003100	.000333	.....	.....	
26,500	53,000	.003333	.000233	.....	.....	
27,000	54,000	.004067	.000734	.....	.....	
27,500	55,000	.004567	.000500	.....	.....	
28,000	56,000	.005133	.000566	.....	.....	Ultimate strength.
28,500	57,000	.005900	.000767	.....	.....	
29,000	58,000	.....	.....	.....	.....	
46,100	92,200	.....	.....	.....	.....	

Failed by triple flexure.

## No. 806.

Marks, <sup>12 R J</sup><sub>B R<sub>c</sub></sub>

Length, 5'.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	-----	-----	
5,000	10,000	.000233	.000133	-----	-----	
7,500	15,000	.000400	.000167	-----	-----	
10,000	20,000	.000533	.000133	-----	-----	
12,500	25,000	.000700	.000167	-----	-----	
15,000	30,000	.000867	.000167	0.	-----	
17,500	35,000	.001033	.000166	-----	-----	
19,000	38,000	.001100	.000067	-----	-----	
19,500	39,000	.001133	.000033	-----	-----	
20,000	40,000	.001133	0.	— .000167	— .000167	Elastic limit.
20,500	41,000	.001300	.000167	-----	-----	
21,000	42,000	.001833	.000533	-----	-----	
21,500	43,000	.002333	.000500	-----	-----	
22,000	44,000	.002867	.000534	-----	-----	
22,500	45,000	.003667	.000800	-----	-----	
23,000	46,000	.004267	.000800	-----	-----	
23,500	47,000	.005133	.000866	-----	-----	
24,000	48,000	.006233	.001100	-----	-----	
24,500	49,000	.006833	.000600	-----	-----	
25,000	50,000	.007667	.000834	-----	-----	Ultimate strength.
39,180	78,360	-----	-----	-----	-----	

Failed by triple flexure.

No. 807.

Marks, <sup>12 R J</sup>  
<sup>B R</sup>

Length, 5'.

Diameter, ".798.

Sectional area, .50 square inch.

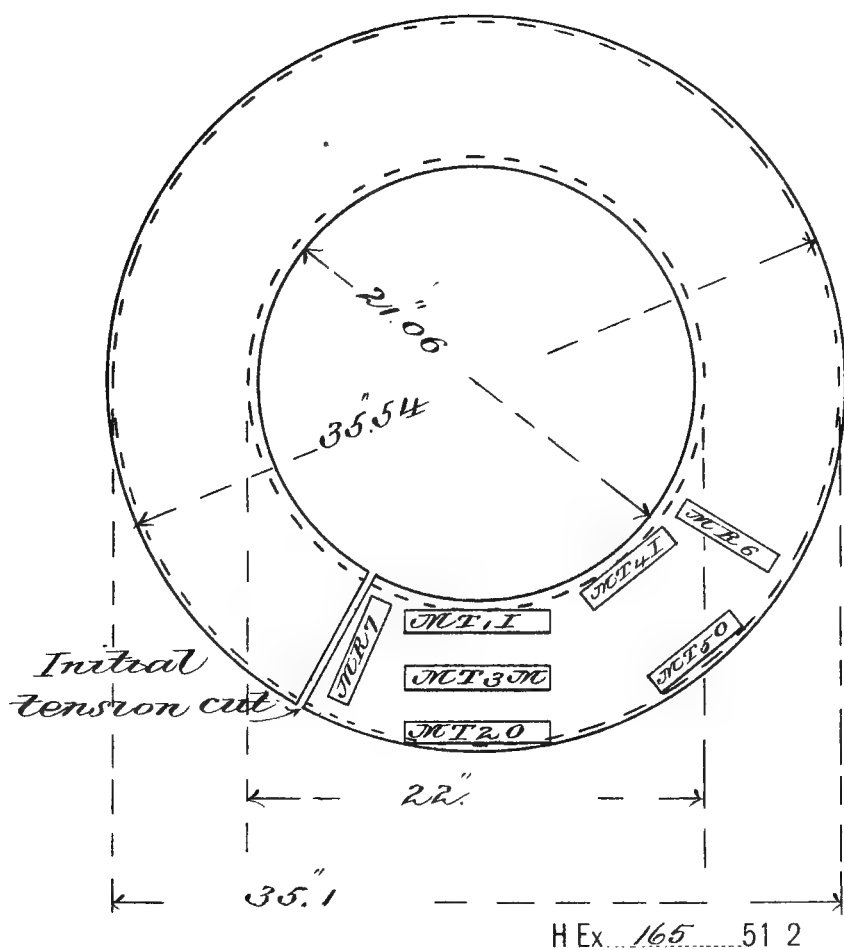
Gauged length, 3'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	1,000	0.	0.	0.	0.	
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000233	.000133	.....	.....	
7,500	15,000	.000400	.000167	.....	.....	
10,000	20,000	.000533	.000133	.....	.....	
12,500	25,000	.000700	.000167	.....	.....	
15,000	30,000	.000900	.000200	0.	.....	
17,500	35,000	.001033	.000133	.....	.....	
19,000	38,000	.001133	.000100	.....	.....	
19,500	39,000	.001167	.000034	.....	.....	Elastic limit.
20,000	40,000	.001167	0.	0.	.....	
20,500	41,000	.001533	.000366	.....	.....	
21,000	42,000	.001867	.000334	.....	.....	
21,500	43,000	.002300	.000433	.....	.....	
22,000	44,000	.002967	.000667	.....	.....	
22,500	45,000	.003500	.000533	.....	.....	
23,000	46,000	.004067	.000567	.....	.....	
23,500	47,000	.004900	.000833	.....	.....	
24,000	48,000	.005433	.000533	.....	.....	
34,500	49,000	.006267	.000834	.....	.....	Ultimate strength.
25,000	50,000	.007267	.001000	.....	.....	
39,470	78,940	.....	.....	.....	.....	

Failed by triple flexure.

# 12-inch B. L. Rifle

## Front end of Jacket





## FRONT END.

No. 3906.

Marks, <sup>12 R J</sup><sub>M T I</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.		
2,500	10,000	.000375	.000225			
5,000	20,000	.000700	.000325			
7,500	30,000	.001000	.000300			
8,750	35,000	.001200	.000200	0.		
10,000	40,000	.001425	.000225	0.		
10,500	42,000	.001450	.000025	0.		
10,750	43,000	.001475	.000025			
11,000	44,000	.001500	.000025			
11,250	45,000	.001550	.000050			Elastic limit.
11,500	46,000	.001600	.000050			
11,750	47,000	.001625	.000025			
12,000	48,000	.001675	.000050			
12,250	49,000	.001725	.000050			
12,500	50,000	.001850	.000125			
12,750	51,000	.002100	.000250			
13,000	52,000	.002500	.000400			
13,250	53,000	.003150	.000650			
13,500	54,000	.003925	.000775			
14,000	56,000	.005000	.001075			
14,500	58,000	.006500	.001500			
15,000	60,000	.008025	.001525			
15,500	62,000	.009800	.001775			
16,000	64,000	.011500	.001700			
16,500	66,000	.013375	.001875			
17,000	68,000	.015000	.001625			
17,500	70,000	.016875	.001875			
18,000	72,000	.018700	.001825			
18,500	74,000	.021000	.002300			
19,000	76,000	.022750	.001750			
19,500	78,000	.025000	.002250			
20,000	80,000	.027500	.002500			
20,500	82,000	.030500	.003000			
21,000	84,000	.033500	.003000			
21,500	86,000	.037000	.003500			
22,000	88,000	.041000	.004000			
22,500	90,000	.045000				
23,000	92,000	.0500	.0050			
23,500	94,000	.0550	.0050			
24,000	96,000	.0675	.0125			
24,500	98,000	.0800	.0125			
24,910	99,640	.1175	.0375			Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 99,640  
 Elastic limit per square inch of original section ..... do... 49,000  
 Elongation per inch after rupture ..... inch... .1400  
 Elongation per inch under strain at elastic limit..... do... .001725  
 Reduction in diameter at point of rupture ..... do... .104  
 Reduction in area after rupture, per centum of original section..... 33.5  
 Position of rupture ..... ".60 from neck  
 Character of broken surface..... granular; silky center  
 Elongation of inch sections ..... ".07, ".09, ".12, ".28"

No. 3907.

Marks, <sup>12 R J</sup><sub>M T<sub>3</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	0.		
2,500	10,000	.000300	.000150			
5,000	20,000	.000650	.000350			
7,500	30,000	.000975	.000325			
8,750	35,000	.001150	.000175	0.		
10,000	40,000	.001250	.000100			
10,500	42,000	.001350	.000100	0.		
10,750	43,000	.001375	.000025			
11,000	44,000	.001400	.000025			
11,250	45,000	.001425	.000025			
11,500	46,000	.001450	.000025			
11,750	47,000	.001500	.000050			
12,000	48,000	.001550	.000050			
12,250	49,000	.001600	.000050			
12,500	50,000	.001650	.000050	.000025	.000025	
12,750	51,000	.001700	.000050			
13,000	52,000	.001750	.000050			Elastic limit.
13,250	53,000	.003375	.001625			
13,500	54,000	.005025	.001650			
13,750	55,000	.006000	.000975			
14,000	56,000	.007000	.001000			
14,500	58,000	.008675	.001675			
15,000	60,000	.010425	.001750			
15,500	62,000	.012500	.002075			
16,000	64,000	.014375	.001875			
16,500	66,000	.016250	.001875			
17,000	68,000	.018250	.002000			
17,500	70,000	.020500	.002250			
18,000	72,000	.022500	.002000			
18,500	74,000	.025000	.002500			
19,000	76,000	.027500	.002500			
19,500	78,000	.030500	.005000			
20,000	80,000	.033500	.003000			
20,500	82,000	.0350	.0015			
21,000	84,000	.0425	.0075			
21,500	86,000	.0475	.0050			
22,000	88,000	.0525	.0050			
22,500	90,000	.0600	.0075			
23,000	92,000	.0725	.0125			
23,500	94,000	.0875	.0150			
23,860	95,440	.1325	.0450			Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 95,440  
 Elastic limit per square inch of original section ..... do.. 52,000  
 Elongation per inch after rupture ..... inch.. .1700  
 Elongation per inch under strain at elastic limit ..... do.. .001750  
 Reduction in diameter at point of rupture ..... do.. .144  
 Reduction in area after rupture, per centum of original section ..... 44.6  
 Position of rupture ..... 1".40 from neck  
 Character of broken surface ..... silky, 60 per cent.; granular at circumference, 40 per cent  
 Elongation of inch sections ..... ".15, ".32, ".12, ".09



No. 3908.

Marks, <sup>12 R J</sup><sub>M T, M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000325	.000225	.....	.....	
5,000	20,000	.000675	.000350	.....	.....	
7,500	30,000	.001000	.000325	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
10,000	40,000	.001425	.000225	.....	.....	
10,500	42,000	.001475	.000050	.000050	.000050	Elastic limit.
10,750	43,000	.001575	.000100	.....	.....	
11,000	44,000	.001775	.000200	.....	.....	
11,250	45,000	.002050	.000275	.....	.....	
11,500	46,000	.003250	.001200	.....	.....	
11,750	47,000	.004500	.001250	.....	.....	
12,000	48,000	.004950	.000450	.....	.....	
12,250	49,000	.005425	.000475	.....	.....	
12,500	50,000	.006250	.000825	.....	.....	
13,000	52,000	.007925	.001675	.....	.....	
13,500	54,000	.009625	.001700	.....	.....	
14,000	56,000	.011475	.001850	.....	.....	
14,500	58,000	.013000	.001525	.....	.....	
15,000	60,000	.015075	.002075	.....	.....	
15,500	62,000	.017250	.002175	.....	.....	
16,000	64,000	.019375	.002125	.....	.....	
16,500	66,000	.021750	.002375	.....	.....	
17,000	68,000	.024200	.002450	.....	.....	
17,500	70,000	.027125	.002935	.....	.....	
18,000	72,000	.030000	.002875	.....	.....	
18,500	74,000	.033000	.003000	.....	.....	
19,000	76,000	.036625	.003625	.....	.....	
19,500	78,000	.0425	.005875	.....	.....	
20,000	80,000	.0475	.0050	.....	.....	
20,500	82,000	.0525	.0050	.....	.....	
21,000	84,000	.0575	.0050	.....	.....	
21,500	86,000	.0700	.0125	.....	.....	
22,000	88,000	.0825	.0125	.....	.....	
22,500	90,000	.1075	.0250	.....	.....	
22,680	90,720	.1525	.0450	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 90,720  
 Elastic limit per square inch of original section ..... do. 42,000  
 Elongation per inch after rupture ..... inch.. .1400  
 Elongation per inch under strain at elastic limit ..... do. .001475  
 Reduction in diameter at point of rupture ..... do. .134  
 Reduction in area after rupture, per centum of original section ..... 41.9  
 Position of rupture ..... 1".40 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".10, ".14, ".34", ".18

No. 808.

Marks, <sup>12 RJ</sup><sub>M T<sub>4</sub>I</sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	1,000	0.	0.	0.	0.	
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000267	.000167	.....	.....	
7,500	15,000	.000433	.000166	.....	.....	
10,000	20,000	.000600	.000167	.....	.....	
12,500	25,000	.000733	.000133	.....	.....	
15,000	30,000	.000900	.000167	0.	.....	
17,500	35,000	.001067	.000167	.....	.....	
20,000	40,000	.001233	.000166	0.	.....	
20,500	41,000	.001267	.000034	.....	.....	
21,000	42,000	.001267	0.	.....	.....	
21,500	43,000	.001300	.000033	.....	.....	
22,000	44,000	.001333	.000033	.....	.....	
22,500	45,000	.001367	.000034	.....	.....	
23,000	46,000	.001400	.000033	.....	.....	
23,500	47,000	.001433	.000033	.....	.....	
24,000	48,000	.001500	.000067	.....	.....	
24,500	49,000	.001500	0.	.....	.....	
25,000	50,000	.001533	.000033	.....	.....	
25,500	51,000	.001567	.000034	.....	.....	
26,000	52,000	.001600	.000033	.....	.....	Elastic limit.
26,500	53,000	.001733	.000133	.....	.....	
27,000	54,000	.003233	.001500	.....	.....	
27,500	55,000	.005833	.002600	.....	.....	
28,000	56,000	.006500	.000667	.....	.....	Ultimate strength.
44,070	88,140	.....	.....	.....	.....	

Failed by triple flexure.

## No. 809.

Marks, <sup>12 R J</sup><sub>M T<sub>5</sub> O</sub>

Length, 5''.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000267	.000167	.....	.....	
7,500	15,000	.000400	.000133	.....	.....	
10,000	20,000	.000533	.000133	.....	.....	
12,500	25,000	.000700	.000167	.....	.....	
15,000	30,000	.000950	.000250	0.	.....	
17,500	35,000	.001100	.000150	.....	.....	
20,000	40,000	.001267	.000167	0.	.....	
22,500	45,000	.001400	.000133	.....	.....	
23,000	46,000	.001433	.000033	.....	.....	Elastic limit.
23,500	47,000	.001467	.000034	.....	.....	
24,000	48,000	.001500	.000033	.....	.....	
24,500	49,000	.001833	.000333	.....	.....	
25,000	50,000	.002500	.000667	.....	.....	
25,500	51,000	.003267	.000767	.....	.....	
26,000	52,000	.003833	.000566	.....	.....	
26,500	53,000	.004500	.000667	.....	.....	
27,000	54,000	.004933	.000433	.....	.....	
27,500	55,000	.005467	.000534	.....	.....	
28,000	56,000	.006433	.000966	.....	.....	Ultimate strength.
43,300	86,600	.....	.....	.....	.....	

Failed by triple flexure.

## No. 810.

Marks, <sup>12 R J</sup><sub>M R<sub>6</sub></sub>

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	-----	-----	
5,000	10,000	.000267	.000167	-----	-----	
7,500	15,000	.000433	.000166	-----	-----	
10,000	20,000	.000600	.000167	-----	-----	
12,500	25,000	.000733	.000133	-----	-----	
15,000	30,000	.000900	.000167	0.	-----	
17,500	35,000	.001067	.000167	-----	-----	
20,000	40,000	.001267	.001200	0.	-----	
20,500	41,000	.001300	.000033	-----	-----	
21,000	42,000	.001300	0.	-----	-----	Elastic limit.
21,500	43,000	.001333	.000033	-----	-----	
22,000	44,000	.001367	.000034	-----	-----	
22,500	45,000	.001500	.000133	-----	-----	
23,000	46,000	.001700	.000200	-----	-----	
23,500	47,000	.002033	.000333	-----	-----	
24,000	48,000	.003300	.000267	-----	-----	
24,500	49,000	.003867	.000567	-----	-----	
25,000	50,000	.004533	.000666	-----	-----	
25,500	51,000	.005100	.000567	-----	-----	
26,000	52,000	.005767	.000667	-----	-----	Ultimate strength.
26,500	53,000	.006500	.000733	-----	-----	
27,000	54,000	.007167	.000667	-----	-----	
42,570	85,140	-----	-----	-----	-----	

Failed by triple flexure.

## No. 811.

Marks, 12 R J  
M R 7

Length, 5'.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	.....	.....	
5,000	10,000	.000233	.000133	.....	.....	
7,500	15,000	.000400	.000167	.....	.....	
10,000	20,000	.000587	.000167	.....	.....	
12,500	25,000	.000733	.000166	.....	.....	
15,000	30,000	.000900	.000167	0.	.....	
17,500	35,000	.001067	.000167	.....	.....	
20,000	40,000	.001233	.000166	0.	.....	
20,500	41,000	.001267	.000034	.....	.....	
21,000	42,000	.001267	0.	.....	.....	Elastic limit.
21,500	43,000	.001300	.000033	.....	.....	
22,000	44,000	.001333	.000033	.....	.....	
22,500	45,000	.001467	.000134	.....	.....	
23,000	46,000	.001667	.000200	.....	.....	
23,500	47,000	.002333	.000666	.....	.....	
24,000	48,000	.003567	.001234	.....	.....	
24,500	49,000	.004100	.000533	.....	.....	
25,000	50,000	.004667	.000567	.....	.....	
25,500	51,000	.005333	.000666	.....	.....	
26,000	52,000	.005967	.000634	.....	.....	Ultimate strength.
26,500	53,000	.006667	.000700	.....	.....	
27,000	54,000	.007267	.000600	.....	.....	
42,910	85,820	.....	.....	.....	.....	
		.....	.....	.....	.....	

Failed by triple flexure.



---

# 12-INCH B. L. RIFLE, NO. 1.

---

SPECIMENS FROM HOOPS GAS CHECK, AND  
BREECH BUSHING.

---





HOOP A<sub>1</sub>.

No. 3900.

Marks, <sup>12 R A<sub>1</sub></sup><sub>T<sub>1</sub> M</sub>

Diameter, ".555.

Sectional area, .242 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
242	1,000	0.	0.	0.	0.	Initial load.
1,210	5,000	.000125	.000125	0.	-----	
2,420	10,000	.000325	.000200	-----	-----	
4,840	20,000	.000675	.000350	-----	-----	
7,260	30,000	.001025	.000350	-----	-----	
9,680	40,000	.001350	.000325	-----	-----	
10,890	45,000	.001550	.000200	.000025	.000025	Elastic limit below 50,000 pounds per square inch.
12,100	50,000	.002700	.001150	.000950	.000925	
12,342	51,000	.004700	.002000	-----	-----	
12,584	52,000	.005100	.000400	-----	-----	
13,068	54,000	.006250	.001150	-----	-----	
13,552	56,000	.007975	.001725	-----	-----	
14,036	58,000	.009450	.001475	-----	-----	
14,520	60,000	.011200	.001750	-----	-----	
14,904	62,000	.012325	.001125	-----	-----	
23,370	96,570	-----	-----	-----	-----	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 96,570  
 Elongation per inch after rupture.....inch.. .1800  
 Reduction in area after rupture, per centum of original section..... 42.7  
 Position of rupture..... 1".40 from neck  
 Character of broken surface..... silky  
 Elongation of inch sections..... ".16, ".32\*, ".14, ".10

No. 3901.

Marks,  $\frac{12 R A_1}{T_1 M}$ 

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000250	.000150	.....	.....	
5,000	20,000	.000550	.000300	.....	.....	
7,500	30,000	.000900	.000350	.....	.....	
10,000	40,000	.001275	.000375	.....	.....	Elastic limit.
11,250	45,000	.001425	.000150	0.	.....	
12,500	50,000	.001600	.000175	.000025	.000025	
12,750	51,000	.004375	.002775	.....	.....	
13,000	52,000	.006500	.002125	.....	.....	
13,250	53,000	.006975	.000475	.....	.....	
13,750	55,000	.007950	.000975	.....	.....	
14,250	57,000	.009750	.001800	.....	.....	
14,750	59,000	.011500	.001750	.....	.....	
15,250	61,000	.013250	.001750	.....	.....	
15,750	63,000	.014750	.001500	.....	.....	Tensile strength.
23,910	95,640	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 95,640  
 Elastic limit per square inch of original section ..... do... 50,000  
 Elongation per inch after rupture ..... inch.. .1625  
 Elongation per inch under strain at elastic limit ..... do... .001600  
 Reduction in diameter at point of rupture ..... do... .064  
 Reduction in area after rupture, per centum of original section ..... 21.4  
 Position of rupture ..... at middle of stem  
 Character of broken surface, granular, 50 per cent.; silky, 50 per cent. Opened cracks in surface of  
 stem in vicinity of place of rupture.  
 Elongation of inch sections ..... ".13, ".25\*, ".17, ".10

HOOP A<sub>3</sub>.

No. 3864.

Marks, <sup>12-R, A<sub>3</sub></sup><sub>T<sub>1</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000425	.000275	0.	0.	
5,000	20,000	.000800	.000375	0.	0.	
7,500	30,000	.001175	.000375	0.	0.	
10,000	40,000	.001550	.000375	0.	0.	
11,250	45,000	.001850	.000100	.000075	.000075	
12,500	50,000	.001775	.000125	.000100	.000025	
12,750	51,000	.001800	.000025	0.	0.	
13,000	52,000	.001850	.000050	0.	0.	
13,250	53,000	.001900	.000050	0.	0.	Elastic limit.
13,500	54,000	.001950	.000050	0.	0.	
13,750	55,000	.002050	.000100	0.	0.	
14,000	56,000	.002100	.000050	0.	0.	
14,250	57,000	.002200	.000100	0.	0.	
14,500	58,000	.002425	.000225	0.	0.	
14,750	59,000	.002575	.000150	0.	0.	
15,250	61,000	.003800	.000225	0.	0.	
15,750	63,000	.005375	.001575	0.	0.	
16,250	65,000	.007000	.001625	0.	0.	Tensile strength.
16,750	67,000	.008625	.001625	0.	0.	
17,250	69,000	.010375	.001750	0.	0.	
26,370	105,480	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 105,480  
 Elastic limit per square inch of original section ..... do... 56,000  
 Elongation per inch after rupture ..... inch... 0.1800  
 Elongation per inch under strain at elastic limit ..... do... .002100  
 Reduction in diameter at point of rupture ..... do... .094  
 Reduction in area after rupture, per centum of original section ..... 30.6  
 Position of rupture ..... at middle of stem  
 Character of broken surface ..... granular; dull, irregular shaped spot at center  
 Elongation of inch sections ..... ".11, ".23, ".27\*, ".11

HOOP A<sub>5</sub>.

No. 3871.

Marks, <sup>12 R, A,</sup>  
<sub>T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000075	.000075	0.	-----	
2,500	10,000	.000250	.000175	-----	-----	
5,000	20,000	.000575	.000325	-----	-----	
7,500	30,000	.000900	.000325	-----	-----	
10,000	40,000	.001250	.000350	-----	-----	
11,250	45,000	.001425	.000175	0.	-----	
12,500	50,000	.001575	.000150	0.	-----	
12,750	51,000	.001625	.000050	-----	-----	Elastic limit.
13,000	52,000	.001700	.000075	-----	-----	
13,250	53,000	.001775	.000075	-----	-----	
13,500	54,000	.001900	.000125	-----	-----	
13,750	55,000	.002100	.000200	-----	-----	
14,000	56,000	.002700	.000600	-----	-----	
14,500	58,000	.004875	.002175	-----	-----	
15,000	60,000	.007000	.002125	-----	-----	
15,500	62,000	.009500	.002500	-----	-----	
16,000	64,000	.010500	.001000	-----	-----	Tensile strength.
16,500	66,000	.012250	.001750	-----	-----	
24,000	96,240	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 96,240  
 Elastic limit per square inch of original section ..... do... 53,000  
 Elongation per inch after rupture ..... inch... .2000  
 Elongation per inch under strain at elastic limit ..... do... .001775  
 Reduction in diameter at point of rupture ..... do... .144  
 Reduction in area after rupture, per centum of original section ..... 44.6  
 Position of rupture ..... 1".50 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".11, ".16, ".37, ".16

HOOP A<sub>6</sub>.

No. 3846.

Marks, <sup>12 R, A<sub>6</sub></sup><sub>T<sub>1</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000275	.000150	.....	.....	
5,000	20,000	.000625	.000350	.....	.....	
7,500	30,000	.001000	.000375	.....	.....	
10,000	40,000	.001300	.000300	.....	.....	
11,250	45,000	.001450	.000150	0.	.....	
12,500	50,000	.001875	.000225	0.	.....	
12,750	51,000	.001725	.000050	.....	.....	
13,000	52,000	.001750	.000025	.....	.....	
13,250	53,000	.001775	.000025	.....	.....	
13,500	54,000	.001800	.000025	.....	.....	
13,750	55,000	.001825	.000025	.....	.....	
14,000	56,000	.001875	.000050	.....	.....	Elastic limit.
14,250	57,000	.001900	.000025	.....	.....	
14,500	58,000	.001975	.000075	.....	.....	
14,750	59,000	.002025	.000050	.....	.....	
15,000	60,000	.002150	.000125	.....	.....	
15,250	61,000	.002300	.000150	.....	.....	
15,500	62,000	.002525	.000025	.....	.....	
16,000	64,000	.003125	.000600	.....	.....	
16,500	66,000	.004625	.001500	.....	.....	
17,000	68,000	.007000	.002375	.....	.....	
17,500	70,000	.009000	.002000	.....	.....	Tensile strength.
18,000	72,000	.010625	.001625	.....	.....	
26,360	105,440	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 105,440  
 Elastic limit per square inch of original section.....do... 59,000  
 Elongation per inch after rupture.....inch.. 0.1475  
 Elongation per inch under strain at elastic limit.....do... .002025  
 Reduction in diameter at point of rupture.....do... .074  
 Reduction in area after rupture, per centum of original section.....do... 24.6  
 Position of rupture.....1".70 from neck  
 Character of broken surface.....granular; dull eccentric spot  
 Elongation of inch sections.....".09, ".14, ".24\*, ".12

HOOP B<sub>2</sub>.

No. 3867.

Marks, <sup>12 R, B<sub>2</sub></sup><sub>T<sub>1</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000175	.000175	0.	0.	
2,500	10,000	.000400	.000225			
5,000	20,000	.000750	.000350			
7,500	30,000	.001125	.000375			
10,000	40,000	.001450	.000325			
11,250	45,000	.001825	.000175	.000025	.000025	
12,500	50,000	.001775	.000150			
12,750	51,000	.001800	.000025			
13,000	52,000	.001825	.000025			
13,250	53,000	.001850	.000025			
13,500	54,000	.001900	.000050			
13,750	55,000	.001900	0.			
14,000	56,000	.001925	.000025			
14,250	57,000	.001975	.000050			
14,500	58,000	.002050	.000075			
14,750	59,000	.002100	.000050			
15,000	60,000	.002150	.000050			
15,250	61,000	.002175	.000025			Elastic limit, not well defined.
15,500	62,000	.002250	.000075			
15,750	63,000	.002325	.000075			
16,000	64,000	.002425	.000100			
16,250	65,000	.002525	.000100			
16,500	66,000	.002750	.000225			
17,000	68,000	.003775	.001025			
17,500	70,000	.006275	.002500			
18,000	72,000	.007850	.001575			
18,500	74,000	.009800	.001950			
27,420	109,680					Tensile strength.

## General summary.

Tensile strength per square inch of original section	pounds.	109,680
Elastic limit per square inch of original section, not well defined	do.	61,000
Elongation per inch after rupture	inch.	0.1600
Elongation per inch under strain at elastic limit	do.	.002175
Reduction in diameter at point of rupture	do.	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture	1".60 from neck	
Character of broken surface	granular, silky center	
Elongation of inch sections	"11, "28, "14, "11	

HOOP B<sub>5</sub>.

No. 3838.

Marks, <sup>12 R, B<sub>5</sub></sup><sub>T<sub>5</sub> O</sub>,

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000050	.000050	0.	0.	
2,500	10,000	.000300	.000250	-----	-----	
5,000	20,000	.000625	.000325	-----	-----	
7,500	30,000	.000975	.000350	-----	-----	
10,000	40,000	.001300	.000325	-----	-----	
11,250	45,000	.001450	.000150	0.	-----	
12,500	50,000	.001675	.000225	0.	-----	
12,750	51,000	.001700	.000025	-----	-----	
13,000	52,000	.001725	.000025	-----	-----	Elastic limit.
13,250	53,000	.001775	.000050	-----	-----	
13,500	54,000	.001975	.000200	-----	-----	
13,750	55,000	.002275	.000300	-----	-----	
14,000	56,000	.002675	.000400	-----	-----	
14,500	58,000	.004175	.001500	-----	-----	
15,000	60,000	.006300	.002125	-----	-----	
15,500	62,000	.008375	.002075	-----	-----	
16,000	64,000	.010175	.001800	-----	-----	
16,500	66,000	.011950	.001775	-----	-----	
24,210	96,840	-----	-----	-----	-----	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 96,840  
 Elastic limit per square inch of original section.....do.. 53,000  
 Elongation per inch after rupture.....inch.. 0.1925  
 Elongation per inch under strain at elastic limit.....do.. .001775  
 Reduction in diameter at point of rupture.....do.. .134  
 Reduction in area after rupture, per centum of original section.....41.9  
 Position of rupture.....1".90 from neck  
 Character of broken surface.....dull, silky  
 Elongation of inch sections.....".13, ".36, ".17, ".11

HOOP B<sub>8</sub>.

No. 3872.

Marks, 12 R, B,  
T, O

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000250	.000125	.....	.....	
5,000	20,000	.000625	.000375	.....	.....	
7,500	30,000	.000950	.000325	.....	.....	
10,000	40,000	.001325	.000375	.....	.....	
11,250	45,000	.001450	.000125	0.	0.	
12,500	50,000	.001625	.000175	0.	0.	
12,750	51,000	.001650	.000025	.....	.....	
13,000	52,000	.001700	.000050	.....	.....	
13,250	53,000	.001750	.000050	.....	.....	
13,500	54,000	.001800	.000050	.....	.....	
13,750	55,000	.001850	.000050	.....	.....	
14,000	56,000	.001900	.000050	.....	.....	
14,250	57,000	.001925	.000025	.....	.....	
14,500	58,000	.001975	.000050	.....	.....	Elastic limit.
14,750	59,000	.002050	.000075	.....	.....	
15,000	60,000	.002175	.000125	.....	.....	
15,250	61,000	.002325	.000150	.....	.....	
15,500	62,000	.002675	.000350	.....	.....	
16,000	64,000	.003900	.001225	.....	.....	
16,500	66,000	.005750	.001850	.....	.....	
17,000	68,000	.007500	.001750	.....	.....	
17,500	70,000	.009000	.001500	.....	.....	
18,000	72,000	.010750	.001170	.....	.....	
27,120	108,480	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 108,480  
 Elastic limit per square inch of original section.....do... 59,000  
 Elongation per inch after rupture.....inch... 1750  
 Elongation per inch under strain at elastic limit.....do... .002050  
 Reduction in diameter at point of rupture.....do... .104  
 Reduction in area after rupture, per centum of original section.....do... 33.5  
 Position of rupture.....". 6 from middle of stem  
 Character of broken surface.....silky, interspersed with granular metal at the circumference  
 Elongation of inch sections.....". 14, ". 28, ". 16, ". 11



HOOP C<sub>3</sub>.

No. 3874.

Marks, <sup>12 R, C<sub>1</sub></sup><sub>T<sub>1</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000075	.000075	0.	0.	
2,500	10,000	.000250	.000175	.....	.....	
5,000	20,000	.000575	.000325	.....	.....	
7,500	30,000	.000875	.000300	.....	.....	
10,000	40,000	.001250	.000375	.....	.....	
11,250	45,000	.001425	.000175	0.	.....	
12,500	50,000	.001575	.000150	0.	.....	
12,750	51,000	.001575	0.	.....	.....	
13,000	52,000	.001625	.000050	.....	.....	
13,250	53,000	.001700	.000075	.....	.....	
13,500	54,000	.001750	.000050	.....	.....	
13,750	55,000	.001800	.000050	.....	.....	
14,000	56,000	.001825	.000025	.....	.....	
14,250	57,000	.001825	0.	.....	.....	Elastic limit.
14,500	58,000	.001825	.000100	.....	.....	
14,750	59,000	.001950	.000025	.....	.....	
15,000	60,000	.002025	.000075	.....	.....	
15,250	61,000	.002125	.000100	.....	.....	
15,500	62,000	.002425	.000300	.....	.....	
15,750	63,000	.002725	.000300	.....	.....	
16,250	65,000	.003975	.001250	.....	.....	
16,750	67,000	.005725	.001750	.....	.....	
17,250	69,000	.007725	.002000	.....	.....	
17,750	71,000	.009475	.001750	.....	.....	Tensile strength.
18,250	73,000	.010975	.001500	.....	.....	
26,410	105,640	.....	.....	.....	.....	

## General summary.

Tensile strength, per square inch of original section.....pounds.. 105,640  
 Elastic limit, per square inch of original section.....do... 60,000  
 Elongation per inch after rupture.....inch... .1425  
 Elongation per inch under strain at elastic limit.....do... .002025

HOOP C<sub>4</sub>.

No. 3839.

Marks, <sup>12 R, C<sub>4</sub></sup><sub>T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,480	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	.....	.....	
5,000	20,000	.000675	.000375	.....	.....	
7,500	30,000	.001025	.000350	.....	.....	
10,000	40,000	.001425	.000400	.....	.....	
11,250	45,000	.001550	.000125	0.	0.	
12,500	50,000	.001750	.000200	0.	0.	
12,750	51,000	.001775	.000025	.....	.....	
13,000	52,000	.001800	.000025	.....	.....	
13,250	53,000	.001825	.000025	.....	.....	Elastic limit.
13,500	54,000	.001875	.000050	.....	.....	
13,750	55,000	.001925	.000050	.....	.....	
14,000	56,000	.001975	.000050	.....	.....	
14,250	57,000	.00205	.000050	.....	.....	
14,500	58,000	.002075	.000050	.....	.....	
14,750	59,000	.002200	.000125	.....	.....	
15,000	60,000	.002400	.000200	.....	.....	
15,250	61,000	.002825	.000425	.....	.....	
15,750	63,000	.003700	.000875	.....	.....	
16,250	65,000	.007250	.003550	.....	.....	Tensile strength.
16,750	67,000	.009250	.002000	.....	.....	
17,250	69,000	.011200	.001950	.....	.....	
17,750	71,000	.013750	.002550	.....	.....	
24,620	98,480	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....	pounds..	98,480
Elastic limit per square inch of original section.....	do...	58,000
Elongation per inch after rupture.....	inch..	0.1700
Elongation per inch under strain at elastic limit.....	do...	.002075
Reduction in diameter at point of rupture.....	do...	.154
Reduction in area after rupture, per centum of original section.....		47.2
Position of rupture.....	1".25 from neck	
Character of broken surface.....	silky	
Elongation of inch sections.....	".20, ".28*, ".11, ".06	

HOOP C<sub>6</sub>.

No. 3873.

Marks, <sup>12 R<sub>1</sub> C<sub>6</sub></sup>  
<sub>B T<sub>1</sub> O</sub>

Diameter, 11.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000250	.000100	.....	.....	
5,000	20,000	.000650	.000400	.....	.....	
7,500	30,000	.000950	.000300	.....	.....	
10,000	40,000	.001275	.000325	.....	.....	
11,250	45,000	.001475	.000200	.000025	.000025	
12,500	50,000	.001700	.000225	.000025	.000025	
12,750	51,000	.001750	.000050	.....	.....	
13,000	52,000	.001800	.000050	.....	.....	
13,250	53,000	.001900	.000100	.....	.....	
13,500	54,000	.001975	.000075	.....	.....	Elastic limit.
13,750	55,000	.002250	.000275	.....	.....	
14,000	56,000	.002450	.000200	.....	.....	
14,250	57,000	.002625	.000175	.....	.....	
14,750	59,000	.003200	.000575	.....	.....	
15,250	61,000	.004575	.001375	.....	.....	
15,750	63,000	.006500	.001925	.....	.....	
16,250	65,000	.008500	.002000	.....	.....	
16,750	67,000	.009750	.001250	.....	.....	
25,710	102,840	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds. 102,840  
 Elastic limit per square inch of original section.....do... 54,000  
 Elongation per inch after rupture.....inch... .1550  
 Elongation per inch under strain at elastic limit.....do... .001975  
 Reduction in diameter at point of rupture.....do... .104  
 Reduction in area after rupture, per centum of original section.....33.5  
 Position of rupture.....".6 from middle of stem  
 Character of broken surface.....granular, silky center  
 Elongation of inch sections.....".12, ".29\*, ".13, ".08

HOOP C<sub>3</sub>.

No. 3868.

Marks, <sup>12 R<sub>1</sub> C<sub>3</sub></sup>  
<sub>B T<sub>1</sub> O</sub>

Diameter, 11.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000350	.000200	-----	-----	
5,000	20,000	.000725	.000375	-----	-----	
7,500	30,000	.001025	.000300	-----	-----	
10,000	40,000	.001400	.000375	-----	-----	
11,250	45,000	.001550	.000150	.000025	.000025	
12,500	50,000	.001750	.000200	.000025	0.	
12,750	51,000	.001800	.000050	-----	-----	
13,000	52,000	.001825	.000025	-----	-----	
13,250	53,000	.001875	.000050	-----	-----	
13,500	54,000	.001925	.000050	-----	-----	
13,750	55,000	.001925	0.	-----	-----	
14,000	56,000	.002000	.000075	-----	-----	Elastic limit.
14,250	57,000	.002050	.000050	-----	-----	
14,500	58,000	.002125	.000075	-----	-----	
14,750	59,000	.002300	.000175	-----	-----	
15,000	60,000	.002500	.000200	-----	-----	
15,500	62,000	.003050	.000550	-----	-----	
16,000	64,000	.004875	.001825	-----	-----	
16,500	66,000	.006750	.001875	-----	-----	
17,000	68,000	.008750	.002000	-----	-----	
25,960	103,840	-----	-----	-----	-----	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 103,840  
 Elastic limit per square inch of original section.....do .. 57,000  
 Elongation per inch after rupture.....inch.. 0.172  
 Elongation per inch under strain at elastic limit.....do .. 0.0205  
 Reduction in diameter at point of rupture.....0.10  
 Reduction in area after rupture, per centum of original section.....33.1  
 Position of rupture.....2".25 from neck  
 Character of broken surface.....granular, silky center  
 Elongation of inch sections.....".10, ".20, ".27, ".11

Hoop C<sub>3</sub>.

No. 3821.

Marks, <sup>12 R<sub>1</sub> C<sub>3</sub></sup>  
<sub>B T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	.....	.....	
5,000	20,000	.000650	.000350	.....	.....	
7,500	30,000	.001000	.000350	.....	.....	
10,000	40,000	.001350	.000350	.....	.....	
11,250	45,000	.001525	.000175	.000025	.000025	Elastic limit (approximate).
12,500	50,000	.001825	.000300	.000125	.000100	
12,750	51,000	.001950	.000125	.....	.....	
13,000	52,000	.002075	.000125	.....	.....	
13,250	53,000	.002175	.000100	.....	.....	
13,750	55,000	.002575	.000400	.....	.....	
14,250	57,000	.003325	.000750	.....	.....	
14,750	59,000	.004350	.001025	.....	.....	Tensile strength.
15,250	61,000	.005550	.001200	.....	.....	
15,750	63,000	.006725	.001175	.....	.....	
26,310	105,240	.....	.....	.....	.....	
		.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 105,240  
 Elastic limit per square inch of original section (approximate).....do... 50,000  
 Elongation per inch after rupture.....inch... 0.1200  
 Elongation per inch under strain at elastic limit.....do... .001825  
 Reduction in diameter at point of rupture .....do... .074  
 Reduction in area after rupture, per centum of original section.....do... 24.6  
 Position of rupture.....1".55 from neck  
 Character of broken surface .....granular, silky spot at the circumference  
 Elongation of inch sections.....".06, ".09, ".23, ".10

No. 3853.

Marks,  $\frac{12 R, C_9}{B T, O}$ Diameter,  $\frac{1}{4}$ .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation. per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.		
2,500	10,000	.000300	.000225			
5,000	20,000	.000625	.000325			
7,500	30,000	.000925	.000300			
10,000	40,000	.001300	.000375			
11,250	45,000	.001475	.000175	0.		
12,500	50,000	.001675	.000200	0.		
12,750	51,000	.001700	.000025			
13,000	52,000	.001725	.000025			
13,250	53,000	.001775	.000050			
13,500	54,000	.001850	.000075			
13,750	55,000	.001900	.000050			
14,000	56,000	.002000	.000100			
14,520	57,000	.002050	.000050			Elastic limit.
14,500	58,000	.002225	.000175			
14,750	59,000	.002375	.000150			
15,000	60,000	.002575	.000200			
15,500	62,000	.003625	.001050			
16,000	64,000	.005175	.001550			
16,500	66,000	.006750	.001575			
17,000	68,000	.008375	.001625			
17,500	70,000	.010000	.001625			
26,420	105,680					Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 105,680  
 Elastic limit per square inch of original section ..... do... 57,000  
 Elongation per inch after rupture ..... inch.. 0.01575  
 Elongation per inch under strain at elastic limit ..... do... 0.002050  
 Reduction in diameter at point of rupture ..... do... .084  
 Reduction in area after rupture, per centum of original section ..... 30.6  
 Position of rupture ..... 2", 20 from neck  
 Character of broken surface ..... granular, silky center  
 Elongation of inch sections ..... "0.09, "24, "18, "12

HOOP D<sub>2</sub>.

No. 3865.

Marks, <sup>12 R, D<sub>2</sub></sup><sub>T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000375	.000250	.....	.....	
5,000	20,000	.000675	.000300	.....	.....	
7,500	30,000	.001025	.000350	.....	.....	
10,000	40,000	.001425	.000400	.....	.....	
11,250	45,000	.001575	.000150	.000025	.000025	
12,500	50,000	.001775	.000200	.000100	.000075	
12,750	51,000	.001850	.000075	.....	.....	
13,000	52,000	.001875	.000025	.....	.....	
13,250	53,000	.001925	.000050	.....	.....	Elastic limit.
13,500	54,000	.002000	.000075	.....	.....	
13,750	55,000	.002150	.000150	.....	.....	
14,000	56,000	.002300	.000150	.....	.....	
14,250	57,000	.002550	.000250	.....	.....	
14,750	59,000	.004250	.001700	.....	.....	
15,250	61,000	.006625	.002375	.....	.....	
15,750	63,000	.008500	.001875	.....	.....	
16,250	65,000	.010300	.001800	.....	.....	
16,750	67,000	.012000	.001700	.....	.....	
24,280	97,120	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 97,120  
 Elastic limit per square inch of original section ..... do.. 54,000  
 Elongation per inch after rupture ..... inch.. 0.1750  
 Elongation per inch under strain at elastic limit ..... do.. 0.002000  
 Reduction in diameter at point of rupture ..... do.. .154  
 Reduction in area after rupture, per centum of original section ..... 47.2  
 Position of rupture ..... 1".40 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".08, ".10, ".23, ".19

H R 165—11

HOOP D<sub>4</sub>.

No. 3854

Marks, <sup>12 R<sub>1</sub> D<sub>4</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000050	.000050	0.	-----	
2,500	10,000	.000200	.000150	-----	-----	
5,000	20,000	.000500	.000300	-----	-----	
7,500	30,000	.000825	.000325	-----	-----	
10,000	40,000	.001175	.000350	-----	-----	
11,250	45,000	.001325	.000150	.000025	.000025	
12,500	50,000	.001625	.000300	.000025	0.	
12,750	51,000	.001650	.000025	-----	-----	
13,000	52,000	.001700	.000050	-----	-----	
13,250	53,000	.001725	.000025	-----	-----	
13,500	54,000	.001775	.000050	-----	-----	
13,750	55,000	.001800	.000025	-----	-----	
14,000	56,000	.001825	.000025	-----	-----	
14,250	57,000	.001850	.000025	-----	-----	Elastic limit.
14,500	58,000	.001925	.000075	-----	-----	
14,750	59,000	.001975	.000050	-----	-----	
15,000	60,000	.002125	.000150	-----	-----	
15,250	61,000	.002925	.000800	-----	-----	
15,500	62,000	.004375	.001450	-----	-----	
16,000	64,000	.005450	.001075	-----	-----	
16,500	66,000	.008750	.003300	-----	-----	
17,000	68,000	.010300	.001550	-----	-----	
17,500	70,000	.012600	.001700	-----	-----	
18,000	72,000	.013700	.001700	-----	-----	Tensile strength.
25,320	101,280	-----	-----	-----	-----	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 101,280  
 Elastic limit per square inch of original section ..... do... 59,000  
 Elongation per inch after rupture ..... inch.. 0.1750  
 Elongation per inch under strain at elastic limit ..... do... .001975  
 Reduction in diameter at point of rupture ..... do... .144  
 Reduction in area after rupture, per centum of original section ..... 44.6  
 Position of rupture ..... 1", 15 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... " 30", " 20, " 11, " 09



## 12-INCH STEEL B. L. RIFLE, NO. 1.

*Specific gravity and hardness of hoops.*

Hoop.	Marks on specimen.	Specific gravity.	Hardness.
A <sub>3</sub>	12 R <sub>1</sub> A <sub>3</sub> R <sub>4</sub> M ...	7.8489	21.64
B <sub>2</sub>	12 R <sub>1</sub> B <sub>2</sub> R <sub>4</sub> M ...	7.8481	23.70
C <sub>4</sub>	12 R <sub>1</sub> C <sub>4</sub> R <sub>4</sub> M ...	7.8511	20.93
D <sub>2</sub>	12 R <sub>1</sub> D <sub>2</sub> R <sub>4</sub> M ...	7.8481	22.39

## TRUNNION HOOP.

No. 3902.

Marks, <sup>12 R T H</sup><sub>T<sub>1</sub> M</sub>Diameter, <sup>12 R T H</sup><sub>T<sub>1</sub> M</sub>, 564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	.....	.....	
5,000	20,000	.000675	.000375	.....	.....	
7,500	30,000	.000975	.000300	.....	.....	
10,000	40,000	.001350	.000375	.....	.....	Elastic limit.
11,000	44,000	.001475	.000125	.....	.....	
12,250	45,000	.003625	.002150	.002050	.002050	
12,500	46,000	.004325	.000700	.....	.....	
11,750	47,000	.004750	.000425	.....	.....	
12,000	48,000	.006425	.001675	.004575	.002525	
12,500	50,000	.007750	.001325	.....	.....	
13,000	52,000	.009750	.002000	.....	.....	
13,500	54,000	.011750	.002000	.....	.....	
14,000	56,000	.013375	.001625	.....	.....	
14,500	58,000	.015750	.002375	.....	.....	Tensile strength.
22,290	89,160	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 89,160  
 Elastic limit per square inch of original section.....do... 44,000  
 Elongation per inch after rupture.....inch... 0.2075  
 Elongation per inch under strain at elastic limit.....do... .001475  
 Reduction in diameter at point of rupture.....do... .164  
 Reduction in area after rupture, per centum of original section.....do... 49.7  
 Position of rupture.....2" from neck  
 Character of broken surface.....silky  
 Elongation of inch sections.....".13, ".41, ".17, ".12

## GAS CHECK.

No. 3855.

Marks, <sup>12</sup>R, <sup>G</sup>C  
<sub>T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation. per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000267	.000167	-----	-----	
7,500	30,000	.001000	.000733	-----	-----	
12,500	50,000	.001667	.000667	-----	-----	
15,000	60,000	.002000	.000333	0.	-----	
17,500	70,000	.002333	.000333	0.	-----	
17,750	71,000	.002367	.000034	-----	-----	
18,000	72,000	.002400	.000033	-----	-----	
18,250	73,000	.002433	.000033	-----	-----	
18,500	74,000	.002533	.000100	-----	-----	Elastic limit.
18,750	75,000	.002633	.000100	-----	-----	
19,000	76,000	.002867	.000234	-----	-----	
19,500	78,000	.003367	.000500	-----	-----	
20,000	80,000	.004167	.000800	-----	-----	
20,500	82,000	.004900	.000733	-----	-----	
21,000	84,000	.005933	.001033	-----	-----	
21,500	86,000	.007000	.001067	-----	-----	
33,680	134,720	-----	-----	-----	-----	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds... 134,720  
 Elastic limit per square inch of original section.....do... 73,000  
 Elongation per inch after rupture.....inch... 0.1267  
 Elongation per inch under strain at elastic limit.....do... .002433  
 Reduction in diameter at point of rupture.....do... .074  
 Position of rupture.....1".50 from neck  
 Character of broken surface.....granular, silky eccentric spot  
 Elongation of inch sections.....".10, ".18, ".10

No. 3856.

Marks,  $^{12}R_1GC$   
 $T_2M$ 

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	-----	
2,500	10,000	.000367	.000300	-----	-----	
7,500	30,000	.001000	.000633	-----	-----	
12,500	50,000	.001667	.000667	-----	-----	
15,000	60,000	.002033	.000366	.000033	.000033	Elastic limit.
17,500	70,000	.002433	.000400	.000033	0.	
17,750	71,000	.002433	0.	-----	-----	
18,000	72,000	.002500	.000067	-----	-----	
18,250	73,000	.002533	.000033	-----	-----	
18,500	74,000	.002567	.000034	-----	-----	
18,750	75,000	.002667	.000100	-----	-----	
19,000	76,000	.002767	.000100	-----	-----	
19,250	77,000	.002933	.000166	-----	-----	
19,500	78,000	.003167	.000234	-----	-----	
19,750	79,000	.003500	.000333	-----	-----	Tensile strength.
20,250	81,000	.004000	.000500	-----	-----	
20,750	83,000	.004833	.000833	-----	-----	
21,250	85,000	.005933	.001100	-----	-----	
21,750	87,000	.006833	.000900	-----	-----	
22,250	89,000	.007833	.001000	-----	-----	
34,220	136,880	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 136,880  
 Elastic limit per square inch of original section..... do... 76,000  
 Elongation per inch after rupture..... inch.. 0.1200  
 Elongation per inch under strain at elastic limit..... do... .002767  
 Reduction in diameter at point of rupture..... do... .064  
 Reduction in area after rupture, per centum of original section..... 21.4  
 Position of rupture..... ".65 from neck  
 Character of broken surface..... granular; silky eccentric spot  
 Elongation of inch sections..... ".09, ".09, ".18"

## BREECH BUSHING.

No. 3869.

Marks, <sup>12 R. B. B.</sup><sub>T. O.</sub>Diameter, <sup>11</sup>/<sub>16</sub> .564.

Sectional area, .25 square inch.

Gauged length, 3'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000187	.000167	0.	.....	
2,500	10,000	.000333	.000166	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.000967	.000300	.....	.....	
10,000	40,000	.001267	.000300	0.	.....	
11,500	46,000	.001567	.000300	0.	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001667	0.	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001800	.000100	.....	.....	
13,250	53,000	.001833	.000033	.....	.....	
13,500	54,000	.001867	.000034	.....	.....	
13,750	55,000	.001900	.000033	.....	.....	
14,000	56,000	.001933	.000033	.....	.....	
14,250	57,000	.001967	.000034	.....	.....	
14,500	58,000	.002033	.000066	.....	.....	Elastic limit.
14,750	59,000	.002067	.000034	.....	.....	
15,000	60,000	.002100	.000033	.....	.....	
15,250	61,000	.002167	.000067	.....	.....	
15,500	62,000	.002233	.000066	.....	.....	
15,750	63,000	.002333	.000100	.....	.....	
16,000	64,000	.002500	.000167	.....	.....	
16,250	65,000	.002833	.000333	.....	.....	
16,500	66,000	.003333	.000500	.....	.....	
17,000	68,000	.004767	.001434	.....	.....	Tensile strength.
17,500	70,000	.007167	.002400	.....	.....	
18,000	72,000	.009000	.001833	.....	.....	
18,500	74,000	.011167	.002167	.....	.....	
19,000	76,000	.013000	.001833	.....	.....	
26,570	106,280	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section .....pounds.. 106,280  
 Elastic limit per square inch of original section .....do... 63,000  
 Elongation per inch after rupture .....inch... 0.1600  
 Elongation per inch under strain at elastic limit.....do... .002333  
 Reduction in diameter at point of rupture.....do... .094  
 Reduction in area after rupture, per centum of original section.....do... 30.6  
 Position of rupture.....1".10 from neck  
 Character of broken surface, granular, dull silky spot, extending from the circumference to center of fracture.  
 Elongation of inch sections.....".22", ".15, ".11

TABULATION OF TENSION SPECIMENS FROM TUBE AND JACKET FOR 12-INCH B. L. RIFLE, NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
3887	Steel tube.....	Inside.....	Pounds. 40,000	Pounds. 79,240	Per cent. 14.3	Per cent. 36.4	Dull silky.
3888	do.....	Outside.....	40,000	78,360	19.8	47.2	Silky irregular.
3889	do.....	Middle.....	32,000	71,280	25.0	47.2	Dull silky.
3890	do.....	Inside.....	38,000	78,000	15.3	44.6	Silky irregular.
3891	do.....	Outside.....	37,000	77,120	22.0	47.2	Granular, 40 per cent.; silky, 60 per cent.
3892	do.....	Middle.....	32,000	70,000	27.0	44.6	Silky oblique.
3893	do.....	Inside.....	45,000	90,000	17.0	36.4	Do.
3894	do.....	Outside.....	45,000	88,720	17.5	47.2	Silky.
3895	do.....	Middle.....	46,000	88,400	17.3	39.2	Silky oblique.
3896	do.....	Inside.....	46,000	92,000	15.3	27.6	Granular, 60 per cent.; silky, 40 per cent.
3897	do.....	Outside.....	46,000	90,000	17.3	30.6	Silky oblique.
3898	do.....	Middle.....	47,000	91,920	11.3	27.6	Granular, 40 per cent.; silky, 60 per cent.
3903	Steel jacket.....	Inside.....	39,000	85,160	18.0	27.6	Granular, 60 per cent.; silky, 40 per cent.
3904	do.....	Outside.....	49,000	98,840	16.0	27.6	Granular, dull silky band.
3905	do.....	Middle.....	35,000	82,560	16.5	27.6	Granular, 50 per cent.; dull silky, 50 per cent.
3906	do.....	Inside.....	49,000	92,640	14.0	33.5	Granular, silky center.
3907	do.....	Outside.....	52,000	93,440	17.0	44.6	Silky, 60 per cent.; granular, 40 per cent.
3908	do.....	Middle.....	42,000	90,720	14.0	41.9	Silky.

TABULATION OF COMPRESSION SPECIMENS FROM TUBE AND JACKET FOR 12-INCH B. L. RIFLE, NO. 1.

No. of test.	Position in gun	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.
797	Steel tube.....	Radial.....	Pounds. 35,000	Pounds. 69,560	Triple flexure.
798	do.....	do.....	34,000	68,540	Do.
799	do.....	Inside.....	31,000	44,200	Do.
800	do.....	Outside.....	33,000	46,470	Do.
801	do.....	Inside.....	38,000	65,800	Do.
802	do.....	Outside.....	34,000	70,960	Do.
803	do.....	Inside.....	47,000	82,600	Do.
804	do.....	Outside.....	48,000	84,820	Do.
805	Steel jacket.....	Radial.....	43,000	91,160	Double flexure.
806	do.....	Inside.....	44,000	73,820	Triple flexure.
807	do.....	Outside.....	46,000	92,200	Do.
808	do.....	Radial.....	40,000	78,360	Do.
809	do.....	Inside.....	40,000	78,940	Do.
810	do.....	Outside.....	52,000	88,140	Do.
811	do.....	Radial.....	48,000	86,600	Do.
		do.....	44,000	85,140	Do.
		do.....	44,000	85,820	Do.

TABULATION OF SPECIMENS FROM HOOPS, GAS CHECK, AND BREECH BUSHING FOR 12-INCH B. L. RIFLE, NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
3800	Hoop A <sub>1</sub> .....	Middle.....	Pounds. *50,000	Pounds. 96,570	Per cent. 18.0	Per cent. 42.7	Silky.
3801	do.....	do.....	50,000	95,640	16.3	21.4	Granular, 50 per cent.; silky, 50 per cent.
3864	Hoop A <sub>3</sub> .....	do.....	56,000	105,480	18.0	30.6	Granular, dull spot.
3871	Hoop A <sub>5</sub> .....	Outside.....	53,000	98,240	20.0	44.6	Silky.
3846	Hoop A <sub>6</sub> .....	do.....	59,000	105,440	14.8	24.6	Granular, dull spot.
3867	Hoop B <sub>1</sub> .....	do.....	61,000	109,680	16.0	33.5	Granular, silky center.
3838	Hoop B <sub>2</sub> .....	do.....	53,000	96,840	19.2	41.0	Dull, silky.
3872	Hoop B <sub>3</sub> .....	do.....	53,000	102,530	17.5	33.5	Silky and granular.
3874	Hoop C <sub>1</sub> .....	do.....	60,000	108,940	14.3	36.4	Granular, silky center.
3839	Hoop C <sub>2</sub> .....	do.....	58,000	98,480	17.0	47.2	Silky.
3873	Hoop C <sub>3</sub> .....	do.....	54,000	102,840	15.5	33.5	Do.
3863	Hoop C <sub>4</sub> .....	do.....	57,000	102,840	17.3	33.5	Do.
3821	Hoop C <sub>5</sub> .....	do.....	50,000	105,240	12.0	24.6	Granular, silky spot.
3853	Hoop C <sub>6</sub> .....	do.....	57,000	105,680	15.8	30.6	Granular, silky center.
3865	Hoop D <sub>1</sub> .....	do.....	54,000	97,120	17.5	47.2	Silky.
3854	Hoop D <sub>2</sub> .....	do.....	59,000	101,280	17.5	44.6	Do.
3802	Trunnion hoop.....	Middle.....	44,000	89,160	20.8	49.7	Do.
3855	Gas check.....	Outside.....	73,000	134,720	12.7	24.6	Granular, silky spot.
3856	do.....	Middle.....	76,000	136,880	12.0	21.4	Do.
3869	Breech bushing.....	Outside.....	63,000	106,280	16.0	30.6	Granular, dull silky spot.

\*\* Below 50,000 pounds.





---

---

## 12-INCH B. L. RIFLED MORTARS.

---

CAST-IRON BODIES, STEEL HOOPS, AND GAS CHECKS.

---

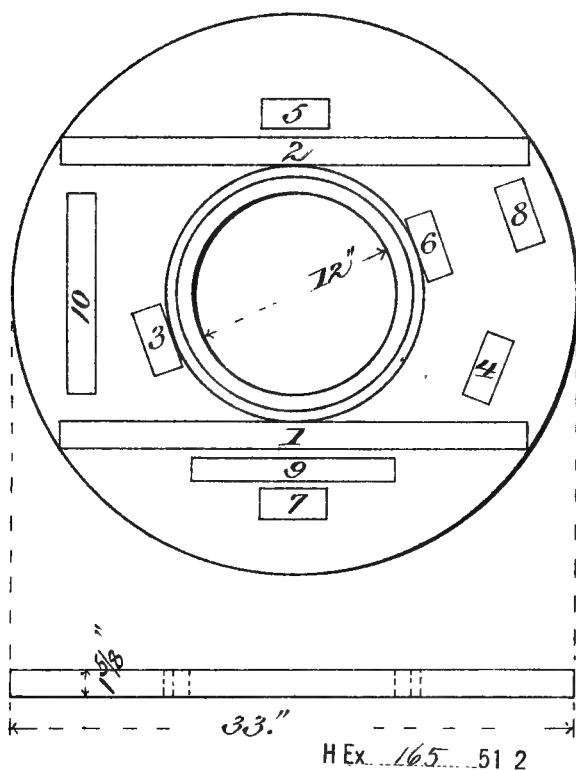
---



# *12-inch B.L. Rifled Mortars.*

## *Cast Iron Bodies.*

*General drawing, specimens taken from  
Muzzle Disc.*

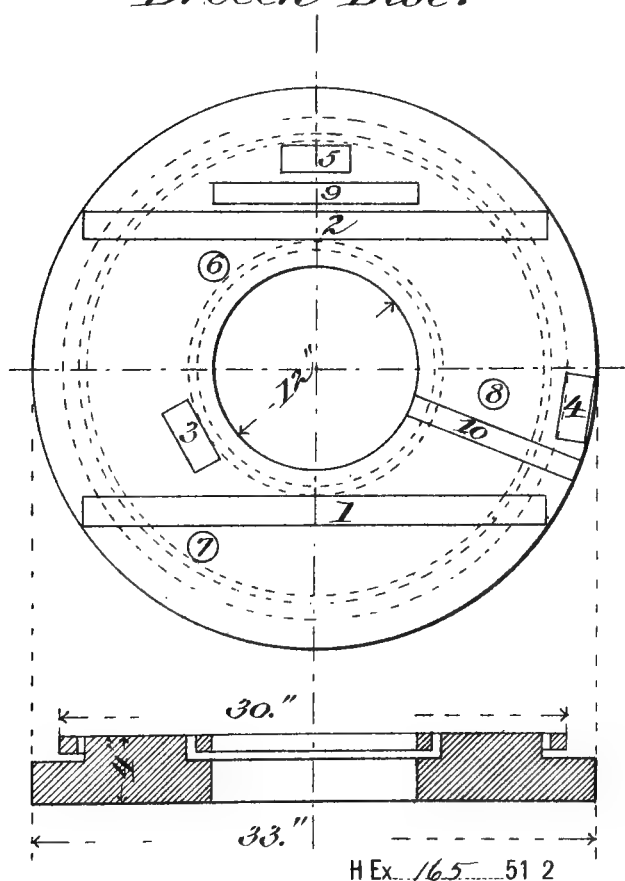




# *12-inch B.L. Rifled Mortars.*

## *Cast Iron Bodies.*

*General drawing, specimens taken from  
Breech Disc.*





CAST IRON BODY No. 1.  
(Condemned.)

No. 3860.

Marks, <sup>12</sup> M C<sub>1</sub> T R<sub>2</sub>  
<sub>B T<sub>1</sub></sub>  
 Length of stem, 24".25.  
 Diameter, 1".129.  
 Sectional area, 1 square inch.  
 Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000105	.000055	-----	-----	
4,000	4,000	.000155	.000050	-----	-----	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000280	.000070	-----	-----	
7,000	7,000	.000360	.000080	-----	-----	
8,000	8,000	.000415	.000055	-----	-----	
9,000	9,000	.000490	.000075	-----	-----	
10,000	10,000	.000575	.000085	.000040	.000035	
11,000	11,000	.000660	.000085	-----	-----	
12,000	12,000	.000730	.000070	.000065	.000025	
13,000	13,000	.000825	.000095	-----	-----	
14,000	14,000	.000925	.000100	.000105	.000040	
15,000	15,000	.001010	.000085	-----	-----	
16,000	16,000	.001130	.000120	.000155	.000050	
17,000	17,000	.001240	.000110	-----	-----	
18,000	18,000	.001380	.000120	.000240	.000085	
19,000	19,000	.001515	.000135	-----	-----	
20,000	20,000	.001680	.000165	.000365	.000125	
21,000	21,000	.001865	.000185	-----	-----	
22,000	22,000	.002070	.000205	.000585	.000180	
23,000	23,000	.002305	.000235	-----	-----	
24,000	24,000	.002620	.000315	.000895	.000310	
25,000	25,000	.002965	.000345	.001150	.000255	
28,010	28,010	-----	-----	-----	-----	Tensile strength.

Fractured 2" from the neck.  
 Appearance, uniform granular.

No. 3861.

Marks, <sup>12 MC, TR<sub>2</sub></sup>  
<sub>BT<sub>2</sub></sub>

Length of stem, 24".25.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000205	.000055	.000005	.000005	
6,000	6,000	.000275	.000070	.....	.....	
7,000	7,000	.000345	.000070	.....	.....	
8,000	8,000	.000405	.000060	.....	.....	
9,000	9,000	.000480	.000075	.....	.....	
10,000	10,000	.000550	.000070	.000040	.000035	
11,000	11,000	.000630	.000080	.....	.....	
12,000	12,000	.000715	.000085	.000060	.000020	
13,000	13,000	.000800	.000085	.....	.....	
14,000	14,000	.000900	.000100	.000100	.000040	
15,000	15,000	.001000	.000100	.....	.....	
16,000	16,000	.001105	.000105	.000150	.000050	
17,000	17,000	.001210	.000105	.....	.....	
18,000	18,000	.001400	.000190	.000215	.000065	
19,000	19,000	.001500	.000100	.....	.....	
20,000	20,000	.001660	.000160	.000365	.000150	
21,000	21,000	.001830	.000170	.....	.....	Tensile strength.
22,000	22,000	.002065	.000235	.000565	.000200	
23,000	23,000	.002315	.000250	.....	.....	
24,000	24,000	.002585	.000270	.000870	.000305	
25,000	25,000	.002945	.000360	.001130	.000260	
26,020	26,020	.....	.....	.....	.....	
.....	.....	.....	.....	.....	.....	

Fractured 2½" from the neck.

Appearance, uniform granular.



## No. 790.

Marks, 12 M C T R,  
B T,

Length, 12"

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00021	.00006	0.	.....	
6,000	6,000	.00026	.00005	.....	.....	
7,000	7,000	.00031	.00005	.....	.....	
8,000	8,000	.00038	.00007	.....	.....	
9,000	9,000	.00043	.00005	.....	.....	
10,000	10,000	.00049	.00006	.00002	.00002	
11,000	11,000	.00058	.00009	.....	.....	
12,000	12,000	.00063	.00005	.....	.....	
13,000	13,000	.00070	.00007	.....	.....	
14,000	14,000	.00077	.00007	.....	.....	
15,000	15,000	.00083	.00006	.00007	.00005	
16,000	16,000	.00090	.00007	.....	.....	
17,000	17,000	.00098	.00008	.....	.....	
18,000	18,000	.00106	.00008	.....	.....	
19,000	19,000	.00114	.00008	.....	.....	
20,000	20,000	.00121	.00007	.00014	.00007	
21,000	21,000	.00128	.00007	.....	.....	Ultimate strength.
22,000	22,000	.00135	.00007	.....	.....	
23,000	23,000	.00142	.00007	.....	.....	
24,000	24,000	.00151	.00009	.....	.....	
25,000	25,000	.00160	.00009	.00024	.00010	
26,000	26,000	.00170	.00010	.....	.....	
27,000	27,000	.00178	.00008	.....	.....	
28,000	28,000	.00189	.00011	.....	.....	
29,000	29,000	.00199	.00010	.....	.....	
30,000	30,000	.00209	.00010	.00047	.00023	
31,000	31,000	.00228	.00019	.....	.....	
32,000	32,000	.00241	.00013	.....	.....	
33,000	33,000	.00256	.00015	.....	.....	
34,000	34,000	.00271	.00015	.....	.....	
35,000	35,000	.00292	.00021	.00096	.00049	
36,000	36,000	.00317	.00025	.....	.....	
37,000	37,000	.00337	.00020	.....	.....	
38,000	38,000	.00359	.00022	.....	.....	
39,000	39,000	.00400	.00041	.....	.....	
40,000	40,000	.00440	.00040	.00215	.00119	
51,480	51,480	.....	.....	.....	.....	

Failed by triple flexure.

No. 791.

Marks, 12 M. C<sub>1</sub> T R<sub>2</sub>  
B R<sub>10</sub>

Length, 10'' .5.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00014	.00004			
5,000	5,000	.00020	.00006	0.		
6,000	6,000	.00024	.00004			
7,000	7,000	.00030	.00006			
8,000	8,000	.00036	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00046	.00006	0.		
11,000	11,000	.00052	.00006			
12,000	12,000	.00060	.00008			
13,000	13,000	.00066	.00006			
14,000	14,000	.00072	.00006			
15,000	15,000	.00078	.00006	.00006	.00006	
16,000	16,000	.00084	.00006			
17,000	17,000	.00092	.00008			
18,000	18,000	.00098	.00006			
19,000	19,000	.00104	.00006			
20,000	20,000	.00112	.00008	.00010	.00004	
21,000	21,000	.00120	.00008			
22,000	22,000	.00128	.00008			
23,000	23,000	.00136	.00008			
24,000	24,000	.00144	.00008			
25,000	25,000	.00150	.00006	.00022	.00012	
26,000	26,000	.00160	.00010			
27,000	27,000	.00170	.00010			
28,000	28,000	.00180	.00010			
29,000	29,000	.00190	.00010			
30,000	30,000	.00202	.00012	.00042	.00020	
31,000	31,000	.00220	.00018			
32,000	32,000	.00232	.00012			
33,000	33,000	.00246	.00014			
34,000	34,000	.00264	.00018			
35,000	35,000	.00286	.00022	.00094	.00052	
36,000	36,000	.00310	.00024			
37,000	37,000	.00332	.00022			
38,000	38,000	.00364	.00032			
39,000	39,000	.00400	.00036			
40,000	40,000	.00440	.00040	.00214	.00120	Ultimate strength.
60,150	60,150	-----	-----	-----	-----	

Failed by triple flexure.

No. 3862.

Marks, 12 M C, T R,  
B T<sub>1</sub>

Length of stem, 22".88.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000095	.000045	.....	.....	
4,000	4,000	.000145	.000050	.....	.....	
5,000	5,000	.000195	.000050	0.	.....	
6,000	6,000	.000245	.000050	.....	.....	
7,000	7,000	.000295	.000050	.....	.....	
8,000	8,000	.000345	.000050	.....	.....	
9,000	9,000	.000400	.000055	.....	.....	
10,000	10,000	.000465	.000065	.000020	.000020	
11,000	11,000	.000520	.000055	.....	.....	
12,000	12,000	.000595	.000075	.000035	.000015	
13,000	13,000	.000660	.000065	.....	.....	
14,000	14,000	.000725	.000065	.000055	.000020	
15,000	15,000	.000790	.000065	.....	.....	
16,000	16,000	.000865	.000075	.000085	.000030	
17,000	17,000	.000945	.000080	.....	.....	
18,000	18,000	.001085	.000090	.000120	.000035	
19,000	19,000	.001120	.000085	.....	.....	
20,000	20,000	.001210	.000090	.000185	.000065	
21,000	21,000	.001320	.000110	.....	.....	
22,000	22,000	.001450	.000130	.000280	.000095	
23,000	23,000	.001585	.000135	.....	.....	
24,000	24,000	.001745	.000160	.000420	.000140	
25,000	25,000	.001925	.000180	.000520	.000100	
30,020	30,020	.....	.....	.....	.....	Tensile strength.

Fractured  $4\frac{1}{4}$ " from neck.

Appearance, uniform granular.

H. Ex. 165—12

No. 3863.

Marks, <sup>12 M C, T R<sub>3</sub></sup><sub>B T<sub>2</sub></sub>

Length of stem, 23".37.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000300	.000050	-----	-----	
8,000	8,000	.000350	.000050	-----	-----	
9,000	9,000	.000400	.000050	-----	-----	
10,000	10,000	.000460	.000060	.000010	.000010	
11,000	11,000	.000520	.000060	-----	-----	
12,000	12,000	.000600	.000080	.000025	.000015	
13,000	13,000	.000655	.000055	-----	-----	
14,000	14,000	.000725	.000070	.000045	.000020	
15,000	15,000	.000790	.000065	-----	-----	
16,000	16,000	.000865	.000075	.000070	.000025	
17,000	17,000	.000950	.000085	-----	-----	
18,000	18,000	.001010	.000060	.000120	.000050	
19,000	19,000	.001120	.000110	-----	-----	
20,000	20,000	.001205	.000085	.000160	.000040	
21,000	21,000	.001315	.000110	-----	-----	
22,000	22,000	.001450	.000135	.000255	.000095	
23,000	23,000	.001580	.000130	-----	-----	
24,000	24,000	.001725	.000145	.000410	.000155	
25,000	25,000	.001895	.000170	.000505	.000095	
31,500	31,500	-----	-----	-----	-----	Stress applied and then released and micrometer observations made under lower loads.
1,000	1,000	-----	-----	.002435	.001930	
2,000	2,000	.002490	.000055	-----	-----	
4,000	4,000	.002600	.000110	-----	-----	
6,000	6,000	.002710	.000110	-----	-----	
8,000	8,000	.002835	.000125	-----	-----	
10,000	10,000	.002955	.000120	-----	-----	
12,000	12,000	.003085	.000130	-----	-----	
14,000	14,000	.003205	.000120	-----	-----	
16,000	16,000	.003335	.000130	-----	-----	
18,000	18,000	.003465	.000130	-----	-----	
20,000	20,000	.003605	.000140	-----	-----	
22,000	22,000	.003745	.000140	-----	-----	
24,000	24,000	.003885	.000140	-----	-----	
22,000	22,000	.003785	— .000100	-----	-----	
20,000	20,000	.003665	— .000110	-----	-----	
18,000	18,000	.003560	— .000105	-----	-----	
16,000	16,000	.003440	— .000120	-----	-----	
14,000	14,000	.003305	— .000135	-----	-----	
12,000	12,000	.003190	— .000115	-----	-----	
10,000	10,000	.003060	— .000130	-----	-----	
8,000	8,000	.002935	— .005125	-----	-----	
6,000	6,000	.002805	— .000130	-----	-----	
4,000	4,000	.002685	— .000140	-----	-----	
2,000	2,000	.002530	— .000135	-----	-----	
1,000	1,000	-----	-----	.002445	.000010	
20,000	20,000	.003610	.001165	-----	-----	
22,000	22,000	.003755	.000145	-----	-----	
24,000	24,000	.003890	.000135	-----	-----	
22,000	22,000	.003785	— .000105	-----	-----	
20,000	20,000	.003665	— .000120	-----	-----	
22,000	22,000	.003785	.000120	-----	-----	
24,000	24,000	.003890	.000105	-----	-----	
22,000	22,000	.003785	— .000105	-----	-----	
20,000	20,000	.003665	— .000120	.002455	.000010	
31,780	31,780	-----	-----	-----	-----	Tensile strength.
0	0	-----	-----	.00275	-----	

Fractured at the neck.

Appearance, uniform granular.

## No. 792.

Marks, 12 M C<sub>1</sub> T R<sub>2</sub>  
B T<sub>3</sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00017	.00005	.....	.....	
5,000	5,000	.00022	.00005	0.	.....	
6,000	6,000	.00026	.00004	.....	.....	
7,000	7,000	.00031	.00005	.....	.....	
8,000	8,000	.00036	.00005	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00047	.00006	.00005	.00005	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00064	.00006	.....	.....	
14,000	14,000	.00070	.00006	.....	.....	
15,000	15,000	.00076	.00006	.00009	.00004	
16,000	16,000	.00081	.00005	.....	.....	
17,000	17,000	.00086	.00005	.....	.....	
18,000	18,000	.00094	.00008	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00106	.00006	.00012	.00003	
21,000	21,000	.00111	.00005	.....	.....	
22,000	22,000	.00119	.00008	.....	.....	
23,000	23,000	.00126	.00007	.....	.....	
24,000	24,000	.00131	.00005	.....	.....	
25,000	25,000	.00139	.00008	.00020	.00008	
26,000	26,000	.00147	.00008	.....	.....	
27,000	27,000	.00156	.00009	.....	.....	
28,000	28,000	.00164	.00008	.....	.....	
29,000	29,000	.00172	.00008	.....	.....	
30,000	30,000	.00185	.00013	.00028	.00008	
31,000	31,000	.00196	.00011	.....	.....	
32,000	32,000	.00210	.00014	.....	.....	
33,000	33,000	.00222	.00012	.....	.....	
34,000	34,000	.00240	.00018	.....	.....	
35,000	35,000	.00260	.00020	.00086	.00058	
36,000	36,000	.00284	.00024	.....	.....	
37,000	37,000	.00300	.00016	.....	.....	
38,000	38,000	.00325	.00025	.....	.....	
39,000	39,000	.00351	.00026	.....	.....	
40,000	40,000	.00389	.00038	.00188	.00102	
54,600	54,600	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## No. 793.

Marks, 12 M C, T R<sub>3</sub>BR<sub>10</sub>

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00014	.00006	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00030	.00004	.....	.....	
9,000	9,000	.00034	.00004	.....	.....	
10,000	10,000	.00040	.00006	0.	.....	
11,000	11,000	.00048	.00008	.....	.....	
12,000	12,000	.00054	.00006	.....	.....	
13,000	13,000	.00058	.00004	.....	.....	
14,000	14,000	.00064	.00006	.....	.....	
15,000	15,000	.00070	.00006	.00004	.00004	
16,000	16,000	.00074	.00004	.....	.....	
17,000	17,000	.00078	.00004	.....	.....	
18,000	18,000	.00082	.00004	.....	.....	
19,000	19,000	.00086	.00004	.....	.....	
20,000	20,000	.00094	.00008	.00006	.00002	
21,000	21,000	.00100	.00006	.....	.....	
22,000	22,000	.00106	.00006	.....	.....	
23,000	23,000	.00112	.00006	.....	.....	
24,000	24,000	.00120	.00008	.....	.....	
25,000	25,000	.00126	.00006	.00012	.00006	
26,000	26,000	.00132	.00006	.....	.....	
27,000	27,000	.00138	.00006	.....	.....	
28,000	28,000	.00146	.00008	.....	.....	
29,000	29,000	.00154	.00008	.....	.....	
30,000	30,000	.00166	.00012	.00024	.00012	
31,000	31,000	.00174	.00008	.....	.....	
32,000	32,000	.00182	.00008	.....	.....	
33,000	33,000	.00196	.00014	.....	.....	
34,000	34,000	.00212	.00016	.....	.....	
35,000	35,000	.00234	.00022	.00066	.00042	
36,000	36,000	.00256	.00022	.....	.....	
37,000	37,000	.00276	.00020	.....	.....	
38,000	38,000	.00302	.00026	.....	.....	
39,000	39,000	.00336	.00034	.....	.....	
40,000	40,000	.00370	.00034	.00174	.00108	
63,800	63,800	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## TENACITY SPECIMENS.

No. of test.	Numbers.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
8003	12 M C, T R <sub>2</sub> B T <sub>3</sub> I	1.129	1.00	28,220	28,220	Uniform granular.
3064	B T <sub>4</sub> O	1.129	1.00	30,730	30,730	Do.
8065	B T <sub>5</sub> M	1.129	1.00	29,010	29,010	Do.
3066	12 M C, T R <sub>3</sub> B T <sub>3</sub> I	1.129	1.00	31,840	31,840	Do.
3067	B T <sub>4</sub> O	1.129	1.00	31,610	31,610	Do.
3068	B T <sub>5</sub> M	1.129	1.00	33,430	33,430	Do.
3069	B L <sub>6</sub> I	1.129	1.00	34,480	34,480	Do.
3070	B L <sub>7</sub> O	1.129	1.00	31,170	31,170	Do.
3071	B L <sub>8</sub> M	1.129	1.00	33,390	33,390	Do.

## CAST-IRON BODY, NO. 2.

No. 3812.

Marks, <sup>12 M R, T R,</sup>  
<sub>M T,</sub>

Diameter, 1".122.

Sectional area, .99 square inch.

Length of stem, 24".10.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
990	1,000	0.	0.	0.	0.	
1,980	2,000	.000060	.000060	-----	-----	
2,970	3,000	.000110	.000050	-----	-----	
3,960	4,000	.000160	.000050	-----	-----	
4,950	5,000	.000210	.000050	.000010	.000010	
5,940	6,000	.000260	.000050	-----	-----	
6,930	7,000	.000320	.000060	-----	-----	
7,920	8,000	.000385	.000065	-----	-----	
8,910	9,000	.000440	.000055	-----	-----	
9,900	10,000	.000495	.000055	.000035	.000025	
10,890	11,000	.000555	.000060	-----	-----	
11,880	12,000	.000610	.000055	.000045	.000010	
12,870	13,000	.000675	.000065	-----	-----	
13,860	14,000	.000745	.000070	.000050	.000005	
14,850	15,000	.000810	.000065	-----	-----	
15,840	16,000	.000875	.000065	.000060	.000010	
16,830	17,000	.000940	.000065	-----	-----	
17,820	18,000	.001010	.000070	.000095	.000035	
18,810	19,000	.001095	.000085	-----	-----	
19,800	20,000	.001180	.000085	.000115	.000020	
20,790	21,000	.001245	.000065	-----	-----	
21,780	22,000	.001350	.000105	.000160	.000045	
22,770	23,000	.001440	.000090	-----	-----	
23,760	24,000	.001555	.000115	.000215	.000055	
24,750	25,000	.001670	.000115	.000265	.000050	
30,840	31,150	-----	-----	-----	-----	Tensile strength.

Fractured 1" from neck.

Appearance, uniform granular.

No. 3813.

Marks,  $12 M T R_2 T R_1$ Diameter,  $1'' .129$ .

Sectional area, 1 square inch.

Length of stem,  $24'' .06$ .Gauged length,  $20''$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000105	.000045	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000315	.000060	.....	.....	
8,000	8,000	.000375	.000060	.....	.....	
9,000	9,000	.000435	.000060	.....	.....	
10,000	10,000	.000490	.000055	.000030	.000025	
11,000	11,000	.000545	.000055	.....	.....	
12,000	12,000	.000605	.000060	.000040	.000010	
13,000	13,000	.000660	.000055	.....	.....	
14,000	14,000	.000735	.000075	.000050	.000010	
15,000	15,000	.000790	.000055	.....	.....	
16,000	16,000	.000860	.000070	.000065	.000015	
17,000	17,000	.000930	.000070	.....	.....	
18,000	18,000	.001000	.000070	.000085	.000020	
19,000	19,000	.001075	.000075	.....	.....	
20,000	20,000	.001150	.000075	.000110	.000025	
21,000	21,000	.001240	.000090	.....	.....	
22,000	22,000	.001340	.000100	.000155	.000045	
23,000	23,000	.001490	.000090	.....	.....	
24,000	24,000	.001540	.000110	.000215	.000060	
25,000	25,000	.001660	.000120	.000260	.000045	
30,020	30,020	.....	.....	.....	.....	Tensile strength.

Fractured  $1''$  from neck.

Appearance, uniform granular.

Specific gravity, 7.2480.

Hardness, 18.38.

## TENACITY SPECIMENS.

No. of Test	Marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3053	$12 M R_2 T R_2$	1.129	1.00	31,670	31,670	7.2465	17.26
3054	$B T_1 I$	1.129	1.00	32,580	32,580	7.2435	16.90
3055	$B T_5 M$	1.129	1.00	32,350	32,350	7.2441	17.44
3056	$B L_5$	1.129	1.00	33,240	33,240	.....	.....
3057	$B L_7$	1.129	1.00	31,980	31,980	.....	.....
3058	$B L_9$	1.129	1.00	31,340	31,340	.....	.....
3059	$12 M R_2 T R_1$	1.129	1.00	32,710	32,710	7.2465	19.81
3060	$M T_5 I$	1.129	1.00	31,690	31,690	7.2370	18.19
3061	$M T_5 O$	1.129	1.00	32,480	32,480	7.2428	18.78
	$M T_5 M$	1.129	1.00				

Appearance of fractures, uniform granular.



No. 3810.

Marks, <sup>12 MR, T R,</sup>  
<sub>B T,</sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 24".56.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060	-----	-----	
3,000	3,000	.000120	.000060	-----	-----	
4,000	4,000	.000175	.000055	-----	-----	
5,000	5,000	.000230	.000055	.000010	.000010	
6,000	6,000	.000285	.000055	-----	-----	
7,000	7,000	.000340	.000055	-----	-----	
8,000	8,000	.000390	.000050	-----	-----	
9,000	9,000	.000455	.000065	-----	-----	
10,000	10,000	.000515	.000060	.000040	.000030	
11,000	11,000	.000575	.000060	-----	-----	
12,000	12,000	.000645	.000070	.000050	.000010	
13,000	13,000	.000705	.000060	-----	-----	
14,000	14,000	.000780	.000075	.000075	.000025	
15,000	15,000	.000845	.000065	-----	-----	
16,000	16,000	.000930	.000085	.000100	.000025	
17,000	17,000	.001005	.000075	-----	-----	
18,000	18,000	.001095	.000090	.000135	.000035	
19,000	19,000	.001175	.000080	-----	-----	
20,000	20,000	.001285	.000110	.000190	.000055	
21,000	21,000	.001390	.000105	-----	-----	Tensile strength.
22,000	22,000	.001505	.000115	.000270	.000080	
23,000	23,000	.001650	.000145	-----	-----	
24,000	24,000	.001785	.000135	.000405	.000135	
25,000	25,000	.002000	.000215	-----	-----	
29,010	29,010	-----	-----	-----	-----	

Fractured 6" from neck.

Appearance, uniform granular.

No. 3811.

Marks,  $^{12}M R_2 T R_2$   
 $B T_2$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 24".43.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060			
3,000	3,000	.000110	.000050			
4,000	4,000	.000160	.000050			
5,000	5,000	.000210	.000050	0.		
6,000	6,000	.000265	.000055			
7,000	7,000	.000325	.000060			
8,000	8,000	.000390	.000065			
9,000	9,000	.000450	.000060			
10,000	10,000	.000505	.000055	.000020	.000020	
11,000	11,000	.000565	.000060			
12,000	12,000	.000635	.000070	.000045	.000025	
13,000	13,000	.000700	.000065			
14,000	14,000	.000765	.000065	.000055	.000010	
15,000	15,000	.000835	.000070			
16,000	16,000	.000910	.000075	.000085	.000030	
17,000	17,000	.000990	.000080			
18,000	18,000	.001065	.000075	.000115	.000030	
19,000	19,000	.001155	.000090			
20,000	20,000	.001260	.000105	.000165	.000050	
21,000	21,000	.001360	.000100			
22,000	22,000	.001490	.000130	.000245	.000080	
23,000	23,000	.001595	.000105			
24,000	24,000	.001750	.000155	.000360	.000115	
25,000	25,000	.001910	.000160	.000440	.000080	
29,210	29,210	-----	-----	-----	-----	Tensile strength.

Fractured  $5\frac{1}{2}$ " from neck.

Appearance, uniform granular.

## No. 779.

Marks,  $12 M R_2 T R_3$   
 $B T_3$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00011	.00005	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00037	.00007	.....	.....	
9,000	9,000	.00042	.00005	.....	.....	
10,000	10,000	.00047	.00005	.00002	.00002	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00064	.00006	.....	.....	
14,000	14,000	.00071	.00007	.....	.....	
15,000	15,000	.00077	.00006	.00007	.00005	
16,000	16,000	.00081	.00004	.....	.....	
17,000	17,000	.00087	.00006	.....	.....	
18,000	18,000	.00093	.00006	.....	.....	
19,000	19,000	.00100	.00007	.....	.....	
20,000	20,000	.00107	.00007	.00010	.00003	
21,000	21,000	.00112	.00005	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00127	.00009	.....	.....	
24,000	24,000	.00133	.00006	.....	.....	
25,000	25,000	.00139	.00006	.00017	.00007	
26,000	26,000	.00147	.00008	.....	.....	
27,000	27,000	.00152	.00005	.....	.....	
28,000	28,000	.00161	.00009	.....	.....	
29,000	29,000	.00170	.00009	.....	.....	
30,000	30,000	.00178	.00008	.00028	.00011	
31,000	31,000	.00188	.00010	.....	.....	
32,000	32,000	.00198	.00010	.....	.....	
33,000	33,000	.00209	.00011	.....	.....	
34,000	34,000	.00220	.00011	.....	.....	
35,000	35,000	.00230	.00010	.00054	.00026	
36,000	36,000	.00246	.00016	.....	.....	
37,000	37,000	.00261	.00015	.....	.....	
38,000	38,000	.00280	.00019	.....	.....	
39,000	39,000	.00300	.00020	.....	.....	
40,000	40,000	.00320	.00020	.00116	.00062	
56,500	56,500	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## No. 780.

Marks,  $12 M R_2 T R_2$   
 $B R_{10}$ 

Length, 10'' 70.

Diameter, 1'' 129.

Sectional area, 1 square inch.

Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006			
3,000	3,000	.00010	.00004			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004			
6,000	6,000	.00024	.00006			
7,000	7,000	.00030	.00006			
8,000	8,000	.00038	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00048	.00002			
12,000	12,000	.00050	.00002			
13,000	13,000	.00052	.00002			
14,000	14,000	.00056	.00004			
15,000	15,000	.00062	.00006	.00004	.00002	
16,000	16,000	.00070	.00008			
17,000	17,000	.00074	.00004			
18,000	18,000	.00080	.00006			
19,000	19,000	.00086	.00006			
20,000	20,000	.00092	.00006	.00008	.00004	
21,000	21,000	.00100	.00008			
22,000	22,000	.00106	.00006			
23,000	23,000	.00110	.00004			
24,000	24,000	.00116	.00006			
25,000	25,000	.00124	.00008	.00012	.00004	
26,000	26,000	.00136	.00012			
27,000	27,000	.00140	.00004			
28,000	28,000	.00146	.00006			
29,000	29,000	.00154	.00008			
30,000	30,000	.00164	.00010	.00026	.00014	
31,000	31,000	.00176	.00012			
32,000	32,000	.00188	.00012			
33,000	33,000	.00198	.00010			
34,000	34,000	.00208	.00010			
35,000	35,000	.00224	.00016	.00058	.00032	
36,000	36,000	.00244	.00020			
37,000	37,000	.00258	.00014			
38,000	38,000	.00278	.00020			
39,000	39,000	.00304	.00026			
40,000	40,000	.00328	.00024	.00136	.00078	
62,150	62,150					Ultimate strength.

Failed by triple flexure.

## CAST IRON BODY, No. 3.

No. 3826.

Marks, <sup>12 M R, T R,</sup>  
<sub>M T<sub>1</sub></sub>Length of stem, 23 $\frac{3}{4}$ ".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	.000005	.000005	
6,000	6,000	.000255	.000055	-----	-----	
7,000	7,000	.000305	.000050	-----	-----	
8,000	8,000	.000360	.000055	-----	-----	
9,000	9,000	.000420	.000060	-----	-----	
10,000	10,000	.000485	.000065	.000010	.000010	
11,000	11,000	.000535	.000050	-----	-----	
12,000	12,000	.000595	.000060	.000030	.000020	
13,000	13,000	.000660	.000065	-----	-----	
14,000	14,000	.000735	.000075	.000040	.000010	
15,000	15,000	.000790	.000055	-----	-----	
16,000	16,000	.000860	.000070	.000060	.000020	
17,000	17,000	.000935	.000075	-----	-----	
18,000	18,000	.001005	.000070	.000095	.000035	
19,000	19,000	.001090	.000085	-----	-----	
20,000	20,000	.001180	.000090	.000135	.000040	
21,000	21,000	.001270	.000090	-----	-----	
22,000	22,000	.001355	.000085	.000190	.000055	
23,000	23,000	.001490	.000135	-----	-----	
24,000	24,000	.001600	.000110	.000285	.000095	
25,000	25,000	.001750	.000150	.000355	.000070	
29,140	29,140	-----	-----	-----	-----	Tensile strength.

Fractured 11" from neck.

Appearance, uniform granular.

No. 3827.

Marks,  $^{12}M R_2 T R_1$   
 $M T_2$ Length of stem, 23 $\frac{5}{8}$ ".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000046	.000045	.....	.....	
3,000	3,000	.000095	.000050	.....	.....	
4,000	4,000	.000145	.000050	.....	.....	
5,000	5,000	.000195	.000050	0.	.....	
6,000	6,000	.000250	.000055	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000355	.000055	.....	.....	
9,000	9,000	.000410	.000055	.....	.....	
10,000	10,000	.000470	.000060	.000015	.000015	
11,000	11,000	.000525	.000055	.....	.....	
12,000	12,000	.000590	.000065	.000025	.000010	
13,000	13,000	.000645	.000055	.....	.....	
14,000	14,000	.000705	.000060	.000040	.000015	
15,000	15,000	.000780	.000075	.....	.....	
16,000	16,000	.000845	.000065	.000060	.000020	
17,000	17,000	.000910	.000065	.....	.....	
18,000	18,000	.000990	.000080	.000090	.000030	
19,000	19,000	.001065	.000075	.....	.....	
20,000	20,000	.001145	.000080	.000115	.000025	
21,000	21,000	.001240	.000095	.....	.....	
22,000	22,000	.001335	.000095	.000165	.000050	
23,000	23,000	.001435	.000100	.....	.....	
24,000	24,000	.001540	.000105	.000245	.000080	
25,000	25,000	.001685	.000145	.000310	.000065	
30,520	30,520	.....	.....	.....	.....	Tensile strength.

Fractured 2" from neck.

Appearance, uniform granular.

Specific gravity, 7.2586.

Hardness, 17.71.

No. 3828.

Marks,  $12 M R_2 T R_2$   
 $B T_1$ Length of stem,  $24\frac{3}{16}$ "

Diameter, 1".129

Sectional area, 1 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000205	.000055	0.	.....	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000315	.000060	.....	.....	
8,000	8,000	.000365	.000050	.....	.....	
9,000	9,000	.000425	.000060	.....	.....	
10,000	10,000	.000490	.000065	.000035	.000035	
11,000	11,000	.000545	.000055	.....	.....	
12,000	12,000	.000605	.000060	.000040	.000005	
13,000	13,000	.000660	.000055	.....	.....	
14,000	14,000	.000735	.000075	.000050	.000010	
15,000	15,000	.000790	.000055	.....	.....	
16,000	16,000	.000860	.000070	.000060	.000010	
17,000	17,000	.000925	.000065	.....	.....	
18,000	18,000	.001005	.000080	.000090	.000030	
19,000	19,000	.001100	.000095	.....	.....	
20,000	20,000	.001185	.000085	.000135	.000045	
21,000	21,000	.001280	.000095	.....	.....	
22,000	22,000	.001390	.000110	.000200	.000065	
23,000	23,000	.001510	.000120	.....	.....	
24,000	24,000	.001645	.000135	.000310	.000110	
25,000	25,000	.001815	.000170	.000400	.000090	
28,820	28,820	.....	.....	.....	.....	Tensile strength.

Fractured 8" from neck.

Appearance, uniform granular.

No. 3829.

Marks,  $^{12}M R_3 T R_2$   
 $B T_2$ Length of stem,  $24\frac{5}{8}$ ".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000100	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000255	.000055	.....	.....	
7,000	7,000	.000310	.000055	.....	.....	
8,000	8,000	.000370	.000060	.....	.....	
9,000	9,000	.000430	.000060	.....	.....	
10,000	10,000	.000485	.000055	.000015	.000015	
11,000	11,000	.000545	.000060	.....	.....	
12,000	12,000	.000605	.000060	.000035	.000020	
13,000	13,000	.000675	.000070	.....	.....	
14,000	14,000	.000740	.000065	.000045	.000010	
15,000	15,000	.000800	.000060	.....	.....	
16,000	16,000	.000860	.000060	.000045	0.	
17,000	17,000	.000910	.000050	.....	.....	
18,000	18,000	.000960	.000050	.000045	0.	
19,000	19,000	.001050	.000090	.....	.....	
20,000	20,000	.001150	.000100	.000085	.000040	
21,000	21,000	.001255	.000105	.....	.....	
22,000	22,000	.001365	.000110	.000155	.000070	
23,000	23,000	.001500	.000135	.....	.....	
24,000	24,000	.001645	.000145	.000285	.000130	
25,000	25,000	.001835	.000190	.000390	.000105	
30,570	30,570	.....	.....	.....	.....	Tensile strength.

Fractured at middle of stem.

Appearance, uniform granular.



## No. 781.

Marks, 12 M R, T R,  
B T,

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00047	.00006	.00003	.00003	
11,000	11,000	.00051	.00004	.....	.....	
12,000	12,000	.00057	.00006	.....	.....	
13,000	13,000	.00063	.00006	.....	.....	
14,000	14,000	.00069	.00006	.....	.....	
15,000	15,000	.00076	.00007	.00007	.00004	
16,000	16,000	.00081	.00005	.....	.....	{ Rested under load 1 hour.
17,000	17,000	.00088	.00007	.....	.....	
18,000	18,000	.00094	.00006	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00106	.00006	.00012	.00005	
21,000	21,000	.00112	.00006	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00125	.00007	.....	.....	
24,000	24,000	.00131	.00008	.....	.....	
25,000	25,000	.00138	.00007	.00018	.00006	
26,000	26,000	.00146	.00008	.....	.....	
27,000	27,000	.00152	.00006	.....	.....	
28,000	28,000	.00160	.00008	.....	.....	
29,000	29,000	.00167	.00007	.....	.....	
30,000	30,000	.00177	.00010	.00031	.00013	
31,000	31,000	.00188	.00011	.....	.....	
32,000	32,000	.00198	.00010	.....	.....	
33,000	33,000	.00208	.00010	.....	.....	
34,000	34,000	.00218	.00010	.....	.....	
35,000	35,000	.00231	.00013	.00061	.00030	
36,000	36,000	.00250	.00019	.....	.....	
37,000	37,000	.00206	.00016	.....	.....	
38,000	38,000	.00286	.00020	.....	.....	
39,000	39,000	.00308	.00022	.....	.....	
40,000	40,000	.00342	.00034	.00141	.00080	
54,890	54,890	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 782. ✓

Marks, <sup>12 M R, T R,</sup><sub>B T<sub>10</sub></sub>Length, 10<sup>5</sup>/<sub>8</sub>".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	.00004	.00004	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00054	.00004	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00066	.00006	.....	.....	
15,000	15,000	.00070	.00004	.00006	.00002	
16,000	16,000	.00074	.00004	.....	.....	
17,000	17,000	.00080	.00006	.....	.....	
18,000	18,000	.00082	.00002	.....	.....	
19,000	19,000	.00088	.00006	.....	.....	
20,000	20,000	.00094	.00006	.00010	.00004	
21,000	21,000	.00098	.00004	.....	.....	
22,000	22,000	.00102	.00004	.....	.....	
23,000	23,000	.00106	.00004	.....	.....	
24,000	24,000	.00110	.00004	.....	.....	
25,000	25,000	.00118	.00008	.00012	.00002	
26,000	26,000	.00126	.00008	.....	.....	
27,000	27,000	.00134	.00008	.....	.....	
28,000	28,000	.00144	.00010	.....	.....	
29,000	29,000	.00152	.00008	.....	.....	
30,000	30,000	.00160	.00008	.00024	.00012	
31,000	31,000	.00170	.00010	.....	.....	
32,000	32,000	.00176	.00006	.....	.....	
33,000	33,000	.00190	.00014	.....	.....	
34,000	34,000	.00200	.00010	.....	.....	
35,000	35,000	.00214	.00014	.00050	.00026	
36,000	36,000	.00232	.00018	.....	.....	
37,000	37,000	.00242	.00010	.....	.....	
38,000	38,000	.00256	.00014	.....	.....	
39,000	39,000	.00276	.00020	.....	.....	
40,000	40,000	.00308	.00032	.00112	.00062	
60,180	60,180	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 4.

No. 3830.

Marks, <sup>12 M R, T R,</sup>  
<sub>M T,</sub>Diameter, 1<sup>11</sup>/<sub>16</sub> 129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Persquare inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000310	.000060	.....	.....	
8,000	8,000	.000365	.000055	.....	.....	
9,000	9,000	.000430	.000065	.....	.....	
10,000	10,000	.000490	.000080	.000015	.000015	
11,000	11,000	.000545	.000055	.....	.....	
12,000	12,000	.000605	.000060	.000025	.000010	
13,000	13,000	.000670	.000065	.....	.....	
14,000	14,000	.000735	.000065	.000045	.000020	
15,000	15,000	.000805	.000070	.....	.....	
16,000	16,000	.000870	.000065	.000060	.000015	
17,000	17,000	.000945	.000075	.....	.....	
18,000	18,000	.001010	.000065	.000080	.000020	
19,000	19,000	.001090	.000080	.....	.....	
20,000	20,000	.001170	.000080	.000110	.000030	
21,000	21,000	.001255	.000085	.....	.....	
22,000	22,000	.001345	.000090	.000145	.000035	
23,000	23,000	.001440	.000095	.....	.....	
24,000	24,000	.001545	.000105	.000210	.000065	
25,000	25,000	.001650	.000105	.000250	.000040	
32,610	32,610	.....	.....	.....	.....	Tensile strength.

Fractured 2" from neck.

Appearance, uniform granular.

H. Ex. 165—13

No. 3831.

Marks, <sup>12 M R, T R,</sup>  
<sup>M T,</sup>Diameter, 1<sup>1</sup>/<sub>2</sub> 129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	.....	.....	
3,000	3,000	.000100	.000055	.....	.....	
4,000	4,000	.000155	.000055	.....	.....	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000255	.000045	.....	.....	
7,000	7,000	.000310	.000035	.....	.....	
8,000	8,000	.000380	.000070	.....	.....	
9,000	9,000	.000430	.000030	.....	.....	
10,000	10,000	.000495	.000065	.000020	.000015	
11,000	11,000	.000545	.000050	.....	.....	
12,000	12,000	.000610	.000065	.000040	.000020	
13,000	13,000	.000670	.000060	.....	.....	
14,000	14,000	.000745	.000075	.000050	.000010	
15,000	15,000	.000805	.000060	.....	.....	
16,000	16,000	.000885	.000080	.000065	.000015	
17,000	17,000	.000955	.000070	.....	.....	
18,000	18,000	.001020	.000065	.000090	.000025	
19,000	19,000	.001095	.000075	.....	.....	
20,000	20,000	.001170	.000075	.000115	.000025	
21,000	21,000	.001250	.000080	.....	.....	
22,000	22,000	.001340	.000090	.000150	.000035	
23,000	23,000	.001430	.000090	.....	.....	
24,000	24,000	.001525	.000095	.000200	.000050	
25,000	25,000	.001655	.000130	.000250	.000050	
32,590	32,590	.....	.....	.....	.....	Tensile strength.

Fractured 2<sup>1</sup>/<sub>2</sub>" from neck.

Appearance, uniform granular.

No. 3832.

Marks, 12 M B<sub>1</sub> T R<sub>1</sub>  
B T<sub>1</sub>Diameter, 1<sup>11</sup>/<sub>16</sub> .129.

Sectional area, 1 square inch.

Gauged length, 20<sup>11</sup>/<sub>16</sub>.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050			
3,000	3,000	.000100	.000050			
4,000	4,000	.000155	.000055			
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000270	.000060			
7,000	7,000	.000335	.000065			
8,000	8,000	.000395	.000060			
9,000	9,000	.000450	.000055			
10,000	10,000	.000510	.000060	.000040	.000035	
11,000	11,000	.000580	.000070			
12,000	12,000	.000655	.000075	.000050	.000010	
13,000	13,000	.000715	.000060			
14,000	14,000	.000800	.000085	.000075	.000025	
15,000	15,000	.000875	.000075			
16,000	16,000	.000950	.000075	.000105	.000030	
17,000	17,000	.001060	.000110			
18,000	18,000	.001140	.000080	.000150	.000045	
19,000	19,000	.001245	.000105			
20,000	20,000	.001355	.000110	.000215	.000065	
21,000	21,000	.001485	.000130			Tensile strength.
22,000	22,000	.001635	.000150	.000340	.000125	
23,000	23,000	.001795	.000160			
24,000	24,000	.001995	.000200	.000515	.000175	
25,000	25,000	.002245	.000250	.000690	.000175	
27,880	27,880					

Fractured 4<sup>11</sup>/<sub>16</sub> from neck.

Appearance, granular, dark mottled.

No. 3833.

Marks,  $^{12}M R_4 T R_3$   
 $B T_2$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000110	.000055	.....	.....	
4,000	4,000	.000175	.000065	.....	.....	
5,000	5,000	.000225	.000050	.000005	.000005	
6,000	6,000	.000280	.000055	.....	.....	
7,000	7,000	.000340	.000060	.....	.....	
8,000	8,000	.000400	.000060	.....	.....	
9,000	9,000	.000455	.000055	.....	.....	
10,000	10,000	.000525	.000070	.000035	.000030	
11,000	11,000	.000585	.000060	.....	.....	
12,000	12,000	.000640	.000055	.000050	.000015	
13,000	13,000	.000720	.000080	.....	.....	
14,000	14,000	.000800	.000080	.000070	.000020	
15,000	15,000	.000875	.000075	.....	.....	
16,000	16,000	.000955	.000080	.000095	.000025	
17,000	17,000	.001060	.000105	.....	.....	
18,000	18,000	.001145	.000085	.000150	.000055	
19,000	19,000	.001240	.000095	.....	.....	
20,000	20,000	.001355	.000105	.000210	.000060	
21,000	21,000	.001485	.000130	.....	.....	Tensile strength.
22,000	22,000	.001630	.000145	.000335	.000125	
23,000	23,000	.001795	.000165	.....	.....	
24,000	24,000	.001960	.000165	.000505	.000170	
25,000	25,000	.002230	.000270	.000670	.000165	
26,080	26,080	.....	.....	.....	.....	
28,080	28,080	.....	.....	.....	.....	

Fractured 4".50 from neck.

Appearance, granular, in part dark mottled.

No. 783.

Marks,  $^{12}M R_1 T R_2$   
 $B T_3$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00009	.00004	.....	.....	
4,000	4,000	.00014	.00005	.....	.....	
5,000	5,000	.00021	.00007	0.	.....	
6,000	6,000	.00027	.00008	.....	.....	
7,000	7,000	.00032	.00005	.....	.....	
8,000	8,000	.00038	.00006	.....	.....	
9,000	9,000	.00043	.00005	.....	.....	
10,000	10,000	.00049	.00008	.00003	.00003	
11,000	11,000	.00056	.00007	.....	.....	
12,000	12,000	.00062	.00008	.....	.....	
13,000	13,000	.00068	.00006	.....	.....	
14,000	14,000	.00073	.00005	.....	.....	
15,000	15,000	.00080	.00007	.00008	.00005	
16,000	16,000	.00086	.00006	.....	.....	
17,000	17,000	.00092	.00006	.....	.....	
18,000	18,000	.00099	.00007	.....	.....	
19,000	19,000	.00105	.00006	.....	.....	
20,000	20,000	.00111	.00006	.00013	.00005	
21,000	21,000	.00119	.00008	.....	.....	
22,000	22,000	.00126	.00007	.....	.....	
23,000	23,000	.00132	.00006	.....	.....	
24,000	24,000	.00139	.00007	.....	.....	
25,000	25,000	.00147	.00008	.00021	.00005	
26,000	26,000	.00153	.00006	.....	.....	
27,000	27,000	.00162	.00009	.....	.....	
28,000	28,000	.00171	.00009	.....	.....	
29,000	29,000	.00179	.00008	.....	.....	
30,000	30,000	.00192	.00013	.00038	.00017	
31,000	31,000	.00202	.00010	.....	.....	
32,000	32,000	.00212	.00010	.....	.....	
33,000	33,000	.00222	.00010	.....	.....	
34,000	34,000	.00239	.00017	.....	.....	
35,000	35,000	.00257	.00018	.00077	.00039	
36,000	36,000	.00280	.00023	.....	.....	
37,000	37,000	.00295	.00015	.....	.....	
38,000	38,000	.00318	.00023	.....	.....	
39,000	39,000	.00347	.00029	.....	.....	
40,000	40,000	.00380	.00033	.00169	.00082	
53,120	53,120	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 784.

Marks,  $^{12}M R_4 T R_2$  $B T_{10}$ Length,  $10\frac{5}{8}$ ''.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00048	.00006	.00002	0.	
11,000	11,000	.00052	.00004	.....	.....	
12,000	12,000	.00056	.00004	.....	.....	
13,000	13,000	.00064	.00008	.....	.....	
14,000	14,000	.00070	.00006	.....	.....	
15,000	15,000	.00076	.00006	.00004	.00002	
16,000	16,000	.00080	.00004	.....	.....	
17,000	17,000	.00088	.00008	.....	.....	
18,000	18,000	.00094	.00006	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00104	.00004	.00010	.00006	
21,000	21,000	.00110	.00006	.....	.....	
22,000	22,000	.00116	.00006	.....	.....	
23,000	23,000	.00124	.00008	.....	.....	
24,000	24,000	.00134	.00010	.....	.....	
25,000	25,000	.00140	.00006	.00020	.00010	
26,000	26,000	.00150	.00010	.....	.....	
27,000	27,000	.00160	.00010	.....	.....	
28,000	28,000	.00168	.00008	.....	.....	
29,000	29,000	.00176	.00008	.....	.....	
30,000	30,000	.00180	.00014	.00034	.00014	
31,000	31,000	.00200	.00010	.....	.....	
32,000	32,000	.00210	.00010	.....	.....	
33,000	33,000	.00226	.00016	.....	.....	
34,000	34,000	.00238	.00012	.....	.....	
35,000	35,000	.00256	.00018	.00076	.00042	
36,000	36,000	.00278	.00022	.....	.....	
37,000	37,000	.00294	.00016	.....	.....	
38,000	38,000	.00320	.00026	.....	.....	
39,000	39,000	.00348	.00028	.....	.....	
40,000	40,000	.00386	.00038	.00172	.00096	
58,600	58,600	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.



## CAST-IRON BODY, No. 5.

No. 3834.

Marks, 12 M R, T R,  
M T<sub>1</sub>.

Length of stem, 27½".

Diameter, 1".128.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000205	.000055	.000005	.000005	
6,000	6,000	.000260	.000055	.....	.....	
7,000	7,000	.000320	.000060	.....	.....	
8,000	8,000	.000380	.000060	.....	.....	
9,000	9,000	.000435	.000055	.....	.....	
10,000	10,000	.000500	.000065	.000035	.000030	
11,000	11,000	.000550	.000050	.....	.....	
12,000	12,000	.000610	.000060	.000040	.000005	
13,000	13,000	.000680	.000070	.....	.....	
14,000	14,000	.000740	.000060	.000050	.000010	
15,000	15,000	.000800	.000060	.....	.....	
16,000	16,000	.000875	.000075	.000085	.000035	
17,000	17,000	.000940	.000065	.....	.....	
18,000	18,000	.001010	.000070	.000100	.000015	
19,000	19,000	.001090	.000080	.....	.....	
20,000	20,000	.001170	.000080	.000140	.000040	
21,000	21,000	.001255	.000085	.....	.....	
22,000	22,000	.001350	.000095	.000185	.000045	
23,000	23,000	.001445	.000095	.....	.....	
24,000	24,000	.001545	.000100	.000245	.000060	
25,000	25,000	.001665	.000120	.000290	.000045	
30,010	30,010	.....	.....	.....	.....	Tensile strength.

Fractured .50 from neck.

Appearance, granular, in part dark mottled.

No. 3835.

Marks,  $^{12} M R_1 T R_1$   
 $M T_2$ Length of stem,  $27\frac{5}{8}$ ".

Diameter, 1".128.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000315	.000060	.....	.....	
8,000	8,000	.000375	.000060	.....	.....	
9,000	9,000	.000430	.000055	.....	.....	
10,000	10,000	.000485	.000055	.000015	.000010	
11,000	11,000	.000540	.000055	.....	.....	
12,000	12,000	.000600	.000060	.000030	.000015	
13,000	13,000	.000660	.000060	.....	.....	
14,000	14,000	.000730	.000070	.000045	.000015	
15,000	15,000	.000795	.000065	.....	.....	
16,000	16,000	.000860	.000065	.000070	.000025	
17,000	17,000	.000935	.000075	.....	.....	
18,000	18,000	.001010	.000075	.000090	.000020	
19,000	19,000	.001090	.000080	.....	.....	
20,000	20,000	.001165	.000075	.000130	.000040	
21,000	21,000	.001255	.000090	.....	.....	
22,000	22,000	.001345	.000090	.000170	.000040	
23,000	23,000	.001445	.000100	.....	.....	
24,000	24,000	.001550	.000105	.000245	.000075	
25,000	25,000	.001675	.000125	.000290	.000045	
29,420	29,420	.....	.....	.....	.....	Tensile strength.

Fractured 10" from neck.

Appearance, granular with dark spangles.

No. 3836.

Marks, <sup>15 M R<sub>2</sub> T R<sub>2</sub></sup>  
<sub>B T<sub>1</sub></sub>Length of stem, 27 $\frac{5}{8}$ ".

Diameter, 1".128.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000205	.000055	0.	.....	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000315	.000060	.....	.....	
8,000	8,000	.000375	.000060	.....	.....	
9,000	9,000	.000435	.000060	.....	.....	
10,000	10,000	.000495	.000060	.000015	.000015	
11,000	11,000	.000555	.000060	.....	.....	
12,000	12,000	.000620	.000065	.000035	.000020	
13,000	13,000	.000685	.000065	.....	.....	
14,000	14,000	.000755	.000070	.000055	.000020	
15,000	15,000	.000825	.000070	.....	.....	
16,000	16,000	.000890	.000065	.000070	.000015	
17,000	17,000	.000945	.000055	.....	.....	
18,000	18,000	.001000	.000055	.000090	.000020	
19,000	19,000	.001075	.000075	.....	.....	
20,000	20,000	.001170	.000095	.000115	.000025	
21,000	21,000	.001270	.000100	.....	.....	Tensile strength.
22,000	22,000	.001395	.000125	.000185	.000070	
23,000	23,000	.001540	.000145	.....	.....	
24,000	24,000	.001705	.000165	.000340	.000155	
25,000	25,000	.001890	.000185	.000435	.000095	
28,890	28,890	.....	.....	.....	.....	

Fractured 11" from neck.

Appearance, uniform granular.

No. 3837.

Marks, <sup>12 M R, T R,</sup>  
B T<sub>2</sub>

Length of stem, 27½".

Diameter, 1".128.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	0.	.....	
6,000	6,000	.000265	.000055	.....	.....	
7,000	7,000	.000330	.000065	.....	.....	
8,000	8,000	.000385	.000055	.....	.....	
9,000	9,000	.000450	.000065	.....	.....	
10,000	10,000	.000505	.000055	.000025	.000025	
11,000	11,000	.000560	.000055	.....	.....	
12,000	12,000	.000630	.000060	.000045	.000020	
13,000	13,000	.000695	.000065	.....	.....	
14,000	14,000	.000755	.000060	.000055	.000010	
15,000	15,000	.000835	.000080	.....	.....	
16,000	16,000	.000905	.000070	.000085	.000030	
17,000	17,000	.000990	.000085	.....	.....	
18,000	18,000	.001065	.000075	.000115	.000030	
19,000	19,000	.001155	.000090	.....	.....	
20,000	20,000	.001255	.000100	.000170	.000055	
21,000	21,000	.001360	.000105	.....	.....	
22,000	22,000	.001495	.000135	.900260	.000090	
23,000	23,000	.001610	.000115	.....	.....	
24,000	24,000	.001760	.000150	.000390	.000130	
25,000	25,000	.001945	.000185	.000495	.000105	
29,976	29,970	.....	.....	.....	.....	Tensile strength.

Fractured 10" from neck.

Appearance, uniform granular.

No. 785.

Marks, 12 M R, T R,  
B T,

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00017	.00005	.....	.....	
5,000	5,000	.00022	.00005	.00001	.00001	
6,000	6,000	.00027	.00005	.....	.....	
7,000	7,000	.00032	.00005	.....	.....	
8,000	8,000	.00037	.00005	.....	.....	
9,000	9,000	.00042	.00005	.....	.....	
10,000	10,000	.00048	.00006	.00002	.00001	
11,000	11,000	.00053	.00005	.....	.....	
12,000	12,000	.00060	.00007	.....	.....	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00071	.00005	.....	.....	
15,000	15,000	.00077	.00006	.00003	.00001	
16,000	16,000	.00082	.00005	.....	.....	
17,000	17,000	.00088	.00006	.....	.....	
18,000	18,000	.00095	.00007	.....	.....	
19,000	19,000	.00100	.00005	.....	.....	
20,000	20,000	.00108	.00008	.00011	.00008	
21,000	21,000	.00112	.00004	.....	.....	
22,000	22,000	.00120	.00008	.....	.....	
23,000	23,000	.00127	.00007	.....	.....	
24,000	24,000	.00132	.00005	.....	.....	
25,000	25,000	.00140	.00008	.00019	.00008	
26,000	26,000	.00148	.00008	.....	.....	
27,000	27,000	.00158	.00005	.....	.....	
28,000	28,000	.00162	.00009	.....	.....	
29,000	29,000	.00169	.00007	.....	.....	
30,000	30,000	.00178	.00009	.00031	.00012	
31,000	31,000	.00190	.00012	.....	.....	
32,000	32,000	.00201	.00011	.....	.....	
33,000	33,000	.00212	.00011	.....	.....	
34,000	34,000	.00228	.00016	.....	.....	
35,000	35,000	.00243	.00015	.00068	.00037	
36,000	36,000	.00258	.00015	.....	.....	
37,000	37,000	.00272	.00014	.....	.....	
38,000	38,000	.00292	.00020	.....	.....	
39,000	39,000	.00322	.00030	.....	.....	
40,000	40,000	.00352	.00030	.00148	.00080	
54,960	54,960	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 786.

Marks,  $12 M R_5 T R_2$   
 $B R_{10}$ Length,  $10''.69$ .Diameter,  $1''.129$ .

Sectional area, 1 square inch.

Gauged length,  $5''$ .

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	.00002	.00002	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00034	.00004	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	.00004	.00002	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00060	.00004	.....	.....	
14,000	14,000	.00066	.00006	.....	.....	
15,000	15,000	.00072	.00006	.00006	.00002	
16,000	16,000	.00078	.00006	.....	.....	
17,000	17,000	.00082	.00004	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00094	.00006	.....	.....	
20,000	20,000	.00100	.00006	.00010	.00004	
21,000	21,000	.00106	.00006	.....	.....	
22,000	22,000	.00112	.00006	.....	.....	
23,000	23,000	.00118	.00006	.....	.....	
24,000	24,000	.00124	.00006	.....	.....	
25,000	25,000	.00132	.00008	.00016	.00006	
26,000	26,000	.00140	.00008	.....	.....	
27,000	27,000	.00146	.00006	.....	.....	
28,000	28,000	.00152	.00006	.....	.....	
29,000	29,000	.00160	.00008	.....	.....	
30,000	30,000	.00170	.00010	.00026	.00010	
31,000	31,000	.00180	.00010	.....	.....	
32,000	32,000	.00190	.00010	.....	.....	
33,000	33,000	.00202	.00012	.....	.....	
34,000	34,000	.00216	.00014	.....	.....	
35,000	35,000	.00230	.00014	.00060	.00034	
36,000	36,000	.00246	.00016	.....	.....	
37,000	37,000	.00264	.00018	.....	.....	
38,000	38,000	.00280	.00016	.....	.....	
39,000	39,000	.00302	.00022	.....	.....	
40,000	40,000	.00336	.00034	.00134	.00074	
61,940	61,940	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 6.

No. 3847.

Marks, <sup>12 M R T B</sup><sub>M T</sub>

Length of stem, 25½".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040	.....	.....	
3,000	3,000	.000090	.000050	.....	.....	
4,000	4,000	.000140	.000050	.....	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000245	.000055	.....	.....	
7,000	7,000	.000300	.000055	.....	.....	
8,000	8,000	.000355	.000055	.....	.....	
9,000	9,000	.000410	.000055	.....	.....	
10,000	10,000	.000460	.000050	.000015	.000015	
11,000	11,000	.000530	.000070	.....	.....	
12,000	12,000	.000590	.000060	.000035	.000020	
13,000	13,000	.000645	.000055	.....	.....	
14,000	14,000	.000710	.000065	.000045	.000010	
15,000	15,000	.000780	.000070	.....	.....	
16,000	16,000	.000840	.000060	.000060	.000015	
17,000	17,000	.000915	.000075	.....	.....	
18,000	18,000	.000985	.000070	.000085	.000025	
19,000	19,000	.001050	.000065	.....	.....	
20,000	20,000	.001130	.000080	.000115	.000030	
21,000	21,000	.001210	.000080	.....	.....	
22,000	22,000	.001285	.000075	.000140	.000025	
23,000	23,000	.001395	.000110	.....	.....	
24,000	24,000	.001500	.000105	.000205	.000065	
25,000	25,000	.001590	.000090	.000240	.000035	
31,150	31,150	.....	.....	.....	.....	Tensile strength.

Fractured ¼" from neck.

No. 3883.

Marks, 12 M R<sub>2</sub> T R<sub>1</sub>Diameter, 1<sup>11</sup>/<sub>16</sub> .129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation. per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000110	.000050	.....	.....	
4,000	4,000	.000150	.000040	.....	.....	
5,000	5,000	.000210	.000060	.000010	.000010	
6,000	6,000	.000260	.000050	.....	.....	
7,000	7,000	.000315	.000055	.....	.....	
8,000	8,000	.000365	.000050	.....	.....	
9,000	9,000	.000425	.000060	.....	.....	
10,000	10,000	.000485	.000060	.000025	.000015	
11,000	11,000	.000550	.000065	.....	.....	
12,000	12,000	.000600	.000050	.000035	.000010	
13,000	13,000	.000660	.000060	.....	.....	
14,000	14,000	.000715	.000055	.000060	.000025	
15,000	15,000	.000780	.000065	.....	.....	
16,000	16,000	.000850	.000070	.000060	0.	
17,000	17,000	.000915	.000065	.....	.....	
18,000	18,000	.000990	.000075	.000075	.000015	
19,000	19,000	.001060	.000070	.....	.....	
20,000	20,000	.001135	.000075	.000105	.000030	
21,000	21,000	.001210	.000075	.....	.....	Tensile strength.
22,000	22,000	.001300	.000090	.000150	.000045	
23,000	23,000	.001395	.000095	.....	.....	
24,000	24,000	.001495	.000100	.000210	.000060	
25,000	25,000	.001605	.000110	.000245	.000095	
29,810	29,810	.....	.....	.....	.....	

Fractured  $\frac{7}{8}$ " from neck.

Appearance, granular; light-colored metal interspersed with dark spots.



No. 3848.

Marks, 12 M R<sub>2</sub> T R<sub>2</sub>  
B T<sub>2</sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000110	.000060	.....	.....	
4,000	4,000	.000160	.000050	.....	.....	
5,000	5,000	.000210	.000050	0.	.....	
6,000	6,000	.000265	.000055	.....	.....	
7,000	7,000	.000325	.000060	.....	.....	
8,000	8,000	.000375	.000050	.....	.....	
9,000	9,000	.000435	.000060	.....	.....	
10,000	10,000	.000500	.000065	.000035	.000035	
11,000	11,000	.000565	.000065	.....	.....	
12,000	12,000	.000620	.000055	.000050	.000015	
13,000	13,000	.000700	.000080	.....	.....	
14,000	14,000	.000760	.000060	.000070	.000020	
15,000	15,000	.000840	.000080	.....	.....	
16,000	16,000	.000915	.000075	.000095	.000025	
17,000	17,000	.000990	.000075	.....	.....	
18,000	18,000	.001080	.000090	.000135	.000040	
19,000	19,000	.001165	.000085	.....	.....	
20,000	20,000	.001265	.000100	.000190	.000055	
21,000	21,000	.001320	.000115	.....	.....	
22,000	22,000	.001500	.000120	.000275	.000085	
23,000	23,000	.001635	.000135	.....	.....	
24,000	24,000	.001785	.000150	.000415	.000140	
25,000	25,000	.001970	.000185	.000530	.000115	
25,850	25,580	.....	.....	.....	.....	Tensile strength.

Fractured 5".75 from neck.

Appearance, granular, in part dark mottled.

Marks,  $12 M R_6 T R_2$   
 $B T$

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Failed by triple flexure.

No. 794.

Marks,  $12 M R_6 T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	-----	-----	
3,000	3,000	.00008	.00004	-----	-----	
4,000	4,000	.00012	.00004	-----	-----	
5,000	5,000	.00016	.00004	0.	-----	
6,000	6,000	.00020	.00004	-----	-----	
7,000	7,000	.00026	.00006	-----	-----	
8,000	8,000	.00030	.00004	-----	-----	
9,000	9,000	.00034	.00004	-----	-----	
10,000	10,000	.00040	.00006	0.	-----	
11,000	11,000	.00046	.00006	-----	-----	
12,000	12,000	.00052	.00006	-----	-----	
13,000	13,000	.00056	.00004	-----	-----	
14,000	14,000	.00062	.00006	-----	-----	
15,000	15,000	.00066	.00004	.00002	.00002	
16,000	16,000	.00072	.00006	-----	-----	
17,000	17,000	.00080	.00006	-----	-----	
18,000	18,000	.00084	.00004	-----	-----	
19,000	19,000	.00090	.00006	-----	-----	
20,000	20,000	.00096	.00006	.00006	.00004	
21,000	21,000	.00106	.00004	-----	-----	
22,000	22,000	.00108	.00006	-----	-----	
23,000	23,000	.00114	.00008	-----	-----	
24,000	24,000	.00120	.00008	-----	-----	
25,000	25,000	.00126	.00006	.00010	.00004	
26,000	26,000	.00134	.00008	-----	-----	
27,000	27,000	.00142	.00008	-----	-----	
28,000	28,000	.00150	.00008	-----	-----	
29,000	29,000	.00158	.00008	-----	-----	
30,000	30,000	.00166	.00008	.00024	.00014	
31,000	31,000	.00176	.00010	-----	-----	
32,000	32,000	.00186	.00010	-----	-----	
33,000	33,000	.00196	.00010	-----	-----	
34,000	34,000	.00206	.00010	-----	-----	
35,000	35,000	.00224	.00018	.00054	.00030	
36,000	36,000	.00240	.00016	-----	-----	
37,000	37,000	.00256	.00016	-----	-----	
38,000	38,000	.00280	.00024	-----	-----	
39,000	39,000	.00302	.00022	-----	-----	
40,000	40,000	.00330	.00028	.00130	.00076	
64,050	64,050	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

H. Ex. 165—14

## CAST-IRON BODY, No. 7.

No. 3843.

Marks, <sup>12 M R<sub>7</sub> T R<sub>1</sub></sup>  
<sub>M T<sub>1</sub></sub>Length of stem, 23 $\frac{3}{4}$ ".

Diameter, 1", 129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050			
3,000	3,000	.000095	.000045			
4,000	4,000	.000140	.000045			
5,000	5,000	.000190	.000050			
6,000	6,000	.000245	.000055			
7,000	7,000	.000295	.000050			
8,000	8,000	.000350	.000055			
9,000	9,000	.000400	.000050			
10,000	10,000	.000455	.000055	.000010	.000010	
11,000	11,000	.000510	.000055			
12,000	12,000	.000570	.000060	.000015	.000005	
13,000	13,000	.000635	.000065			
14,000	14,000	.000695	.000060	.000040	.000025	
15,000	15,000	.000755	.000060			
16,000	16,000	.000815	.000060	.000060	.000020	
17,000	17,000	.000895	.000080			
18,000	18,000	.000960	.000065	.000090	.000030	
19,000	19,000	.001045	.000085			
20,000	20,000	.001115	.000070	.000125	.000035	
21,000	21,000	.001205	.000090			
22,000	22,000	.001300	.000095	.000170	.000045	
23,000	23,000	.001400	.000100			
24,000	24,000	.001505	.000105	.000250	.000080	
25,000	25,000	.001625	.000120	.000300	.000050	
31,380	31,380					Tensile strength.

Fractured 1".50 from neck.

Appearance, uniform granular.

No. 3844.

Marks,  $12 M R, T R_2$   
 $B T_2$ Length of stem,  $23\frac{1}{4}''$ .Diameter,  $1''.129$ .

Sectional area, 1 square inch.

Gauged length,  $20''$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050			
3,000	3,000	.000100	.000050			
4,000	4,000	.000150	.000050			
5,000	5,000	.000200	.000050	.000005	.000005	
6,000	6,000	.000255	.000055			
7,000	7,000	.000305	.000050			
8,000	8,000	.000360	.000055			
9,000	9,000	.000415	.000055			
10,000	10,000	.000480	.000065	.000015	.000010	
11,000	11,000	.000545	.000065			
12,000	12,000	.000595	.000050	.000015	.000030	
12,000	13,000	.000665	.000070			
14,000	14,000	.000730	.000065	.000050	.000005	
15,000	15,000	.000800	.000070			
16,000	16,000	.000865	.000065	.000085	.000035	
17,000	17,000	.000945	.000080			
18,000	18,000	.001010	.000065	.000110	.000025	
19,000	19,000	.001105	.000085			
20,000	20,000	.001190	.000085	.000155	.000045	
21,000	21,000	.001295	.000105			
22,000	22,000	.001395	.000100	.000205	.000050	
23,000	23,000	.001515	.000110			
24,000	24,000	.001670	.000155	.000315	.000140	Tensile strength.
25,000	25,000	.001845	.000175	.000445	.000110	
30,240	30,240					

Fractured  $4''.25$  from neck.

Appearance, uniform granular.

No. 787.

Marks,  $12 M R_7 T R_3$   
 $B T_3$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00007	.00007	.....	.....	
3,000	3,000	.00013	.00005	.....	.....	
4,000	4,000	.00017	.00005	.....	.....	
5,000	5,000	.00022	.00005	0.	.....	
6,000	6,000	.00027	.00005	.....	.....	
7,000	7,000	.00030	.00003	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00047	.00006	.00002	.00002	
11,000	11,000	.00051	.00004	.....	.....	
12,000	12,000	.00056	.00005	.....	.....	
13,000	13,000	.00061	.00005	.....	.....	
14,000	14,000	.00067	.00006	.....	.....	
15,000	15,000	.00073	.00006	.00006	.00004	
16,000	16,000	.00079	.00006	.....	.....	
17,000	17,000	.00085	.00006	.....	.....	
18,000	18,000	.00091	.00006	.....	.....	
19,000	19,000	.00097	.00006	.....	.....	
20,000	20,000	.00102	.00005	.00010	.00004	
21,000	21,000	.00110	.00008	.....	.....	
22,000	22,000	.00115	.00005	.....	.....	
23,000	23,000	.00120	.00005	.....	.....	
24,000	24,000	.00126	.00006	.....	.....	
25,000	25,000	.00135	.00009	.00016	.00006	
26,000	26,000	.00143	.00008	.....	.....	
27,000	27,000	.00150	.00007	.....	.....	
28,000	28,000	.00157	.00007	.....	.....	
29,000	29,000	.00166	.00009	.....	.....	
30,000	30,000	.00172	.00005	.00026	.00010	
31,000	31,000	.00183	.00011	.....	.....	
32,000	32,000	.00193	.00010	.....	.....	
33,000	33,000	.00204	.00011	.....	.....	
34,000	34,000	.00215	.00011	.....	.....	
35,000	35,000	.00226	.00011	.00055	.00029	
36,000	36,000	.00244	.00018	.....	.....	
37,000	37,000	.00261	.00017	.....	.....	
38,000	38,000	.00280	.00019	.....	.....	
39,000	39,000	.00298	.00018	.....	.....	
40,000	40,000	.00326	.00028	.00125	.00070	
57,280	57,280	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 8.

No. 3858.

Marks, <sup>12</sup> M R, T R,  
          <sup>M T, M</sup>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000310	.000060	.....	.....	
8,000	8,000	.000365	.000055	.....	.....	
9,000	9,000	.000415	.000050	.....	.....	
10,000	10,000	.000475	.000060	.000025	.000025	
11,000	11,000	.000535	.000060	.....	.....	
12,000	12,000	.000610	.000075	.000035	.000010	
13,000	13,000	.000660	.000050	.....	.....	
14,000	14,000	.000710	.000050	.000050	.000015	
15,000	15,000	.000780	.000070	.....	.....	
16,000	16,000	.000865	.000085	.000080	.000030	
17,000	17,000	.000935	.000070	.....	.....	
18,000	18,000	.001010	.000075	.000115	.000035	
19,000	19,000	.001085	.000075	.....	.....	
20,000	20,000	.001185	.000100	.000160	.000045	
21,000	21,000	.001285	.000100	.....	.....	
22,000	22,000	.001405	.000120	.000240	.000080	
23,000	23,000	.001525	.000120	.....	.....	
24,000	24,000	.001675	.000150	.000380	.000140	
25,000	25,000	.001840	.000165	.000480	.000100	
31,070	31,070	.....	.....	.....	.....	Tensile strength.

Fractured 2" from neck.

Appearance, granular, in part dark mottled.

Specific gravity, 7.2781.

Hardness, 17.17.

No. 3859.

Marks,  $^{12} M R_2 T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040	.....	.....	
3,000	3,000	.000090	.000050	.....	.....	
4,000	4,000	.000140	.000050	.....	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000240	.000050	.....	.....	
7,000	7,000	.000295	.000055	.....	.....	
8,000	8,000	.000350	.000055	.....	.....	
9,000	9,000	.000405	.000055	.....	.....	
10,000	10,000	.000465	.000060	.000010	.000010	
11,000	11,000	.000515	.000050	.....	.....	
12,000	12,000	.000575	.000060	.000015	.000005	
13,000	13,000	.000635	.000060	.....	.....	
14,000	14,000	.000710	.000075	.000035	.000020	
15,000	15,000	.000775	.000065	.....	.....	
16,000	16,000	.000850	.000075	.000060	.000025	
17,000	17,000	.000925	.000085	.....	.....	
18,000	18,000	.001005	.000070	.000105	.000045	
19,000	19,000	.001085	.000080	.....	.....	
20,000	20,000	.001190	.000105	.000160	.000055	
21,000	21,000	.001305	.000115	.....	.....	
22,000	22,000	.001410	.000105	.000.55	.000095	Tensile strength.
23,000	23,000	.001555	.000145	.....	.....	
24,000	24,000	.001705	.000250	.000305	.000140	
25,000	25,000	.001900	.000195	.000510	.000115	
28,300	28,300	.....	.....	.....	.....	

Fractured 11" from neck.

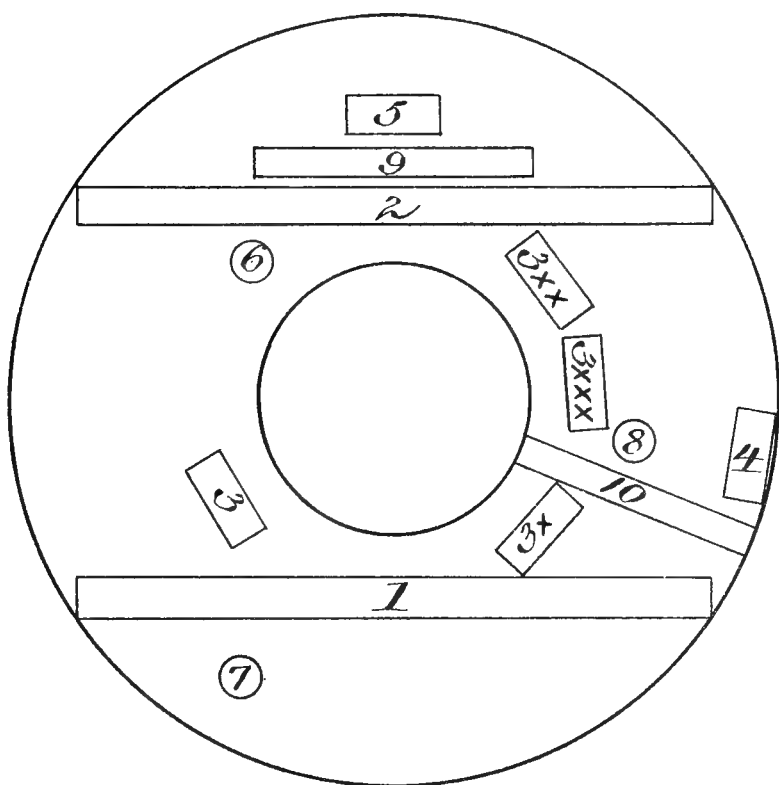
Appearance, uniform granular.



*12-inch B.L. Rifled Mortars.*

*Cast Iron Body No. 8.*

*Specimens from Breech disc.*





No. 789.

Marks, 12 M R<sub>1</sub> T R<sub>1</sub>  
B T<sub>9</sub>

Length, 12''.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00010	.00007	.....	.....	
4,000	4,000	.00013	.00003	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00023	.00005	.....	.....	
7,000	7,000	.00028	.00005	.....	.....	
8,000	8,000	.00033	.00005	.....	.....	
9,000	9,000	.00038	.00005	.....	.....	
10,000	10,000	.00043	.00005	.00002	.00002	
11,000	11,000	.00049	.00006	.....	.....	
12,000	12,000	.00054	.00005	.....	.....	
13,000	13,000	.00059	.00005	.....	.....	
14,000	14,000	.00065	.00006	.....	.....	
15,000	15,000	.00070	.00005	.00007	.00005	
16,000	16,000	.00076	.00006	.....	.....	
17,000	17,000	.00081	.00005	.....	.....	
18,000	18,000	.00087	.00006	.....	.....	
19,000	19,000	.00092	.00005	.....	.....	
20,000	20,000	.00098	.00006	.00010	.00003	
21,000	21,000	.00106	.00008	.....	.....	
22,000	22,000	.00112	.00006	.....	.....	
23,000	23,000	.00119	.00007	.....	.....	
24,000	24,000	.00124	.00005	.....	.....	
25,000	25,000	.00122	.00008	.00017	.00007	
26,000	26,000	.00140	.00008	.....	.....	
27,000	27,000	.00147	.00007	.....	.....	
28,000	28,000	.00153	.00006	.....	.....	
29,000	29,000	.00162	.00009	.....	.....	
30,000	30,000	.00176	.00014	.00032	.00015	
31,000	31,000	.00187	.00011	.....	.....	
32,000	32,000	.00197	.00010	.....	.....	
33,000	33,000	.00212	.00015	.....	.....	
34,000	34,000	.00226	.00014	.....	.....	
35,000	35,000	.00243	.00017	.00075	.00043	
36,000	36,000	.00263	.00020	.....	.....	
37,000	37,000	.00283	.00020	.....	.....	
38,000	38,000	.00310	.00027	.....	.....	
39,000	39,000	.00340	.00030	.....	.....	
40,000	40,000	.00368	.00028	.00182	.00107	
55,260	55,260	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 9.

No. 3909.

Marks, <sup>12 M R<sub>2</sub> T R<sub>1</sub></sup>  
<sub>MT<sub>1</sub></sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000105	.000055	-----	-----	
4,000	4,000	.000155	.000050	-----	-----	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000260	.000055	-----	-----	
7,000	7,000	.000315	.000055	-----	-----	
8,000	8,000	.000380	.000065	-----	-----	
9,000	9,000	.000435	.000055	-----	-----	
10,000	10,000	.000495	.000060	.000035	.000030	
11,000	11,000	.000555	.000060	-----	-----	
12,000	12,000	.000630	.000075	.000045	.000010	
13,000	13,000	.000690	.000060	-----	-----	
14,000	14,000	.000765	.000075	.000080	.000035	
15,000	15,000	.000830	.000065	-----	-----	
16,000	16,000	.000900	.000070	.000105	.000025	
17,000	17,000	.000985	.000085	-----	-----	
18,000	18,000	.001055	.000070	.000150	.000045	
19,000	19,000	.001150	.000095	-----	-----	
20,000	20,000	.001250	.000100	.000215	.000065	
21,000	21,000	.001355	.000105	-----	-----	
22,000	22,000	.001470	.000115	.000305	.000090	
23,000	23,000	.001635	.000165	-----	-----	
24,000	24,000	.001770	.000135	.000445	.000140	
25,000	25,000	.001985	.000215	.000560	.000115	
30,710	30,710	-----	-----	-----	-----	Tensile strength.

Fractured 5½" from neck.

Appearance, uniform granular.

Specific gravity, 7.2811.

Hardness, 17.08.

No. 3910.

Marks,  $^{12}M R_2 T R_2$   
 $^{B T_1}$ 

Diameter, 1".275.

Sectional area, .989 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
998	1,000	0.	0.000050	0.	0.	Initial load.
1,996	2,000	.000050	.000050			
2,994	3,000	.000095	.000015			
3,992	4,000	.000140	.000045			
4,990	5,000	.000195	.000055	0.		
5,988	6,000	.000245	.000050			
6,986	7,000	.000290	.000045			
7,984	8,000	.000340	.000050			
8,982	9,000	.000400	.000060			
9,980	10,000	.000450	.000050	.000015	.000015	
10,978	11,000	.000505	.000055			
11,976	12,000	.000555	.000050	.000015	0.	
12,974	13,000	.000625	.000070			
13,972	14,000	.000685	.000060	.000035	.000020	
14,970	15,000	.000750	.000065			
15,968	16,000	.000805	.000055	.000035	.000020	
16,966	17,000	.000875	.000070			
17,964	18,000	.000935	.000060	.000065	.000010	
18,962	19,000	.001000	.000065			
19,960	20,000	.001060	.000060	.000100	.000035	
20,958	21,000	.001145	.000085			
21,956	22,000	.001205	.000060	.000135	.000035	Tensile strength.
22,954	23,000	.001300	.000095			
23,952	24,000	.001390	.000090	.000165	.000030	
24,950	25,000	.001490	.000100	.000205	.000040	
31,900	31,960					

Fractured 1" from neck.

Appearance, uniform granular.

Specific gravity, 7.2839.

Hardness, 16.90.

No. 821.

Marks,  $^{12}M R_2 T R_2$   
 $B T_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00002	.00002	-----	-----	
3,000	3,000	.00008	.00006	-----	-----	
4,000	4,000	.00012	.00004	-----	-----	
5,000	5,000	.00018	.00006	0.	-----	
6,000	6,000	.00022	.00004	-----	-----	
7,000	7,000	.00028	.00006	-----	-----	
8,000	8,000	.00033	.00005	-----	-----	
9,000	9,000	.00039	.00006	-----	-----	
10,000	10,000	.00043	.00004	0.	-----	
11,000	11,000	.00050	.00007	-----	-----	
12,000	12,000	.00057	.00007	-----	-----	
13,000	13,000	.00061	.00004	-----	-----	
14,000	14,000	.00068	.00007	-----	-----	
15,000	15,000	.00072	.00004	.00004	.00004	
16,000	16,000	.00080	.00008	-----	-----	
17,000	17,000	.00086	.00006	-----	-----	
18,000	18,000	.00092	.00006	-----	-----	
19,000	19,000	.00098	.00006	-----	-----	
20,000	20,000	.00104	.00006	.00010	.00006	
21,000	21,000	.00111	.00007	-----	-----	
22,000	22,000	.00117	.00006	-----	-----	
23,000	23,000	.00112	.00005	-----	-----	
24,000	24,000	.00130	.00008	-----	-----	
25,000	25,000	.00137	.00007	.00017	.00007	
26,000	26,000	.00144	.00007	-----	-----	
27,000	27,000	.00151	.00007	-----	-----	
28,000	28,000	.00159	.00008	-----	-----	
29,000	29,000	.00169	.00010	-----	-----	
30,000	30,000	.00179	.00010	.00030	.00013	
31,000	31,000	.00180	.00011	-----	-----	
32,000	32,000	.00200	.00010	-----	-----	
33,000	33,000	.00215	.00015	-----	-----	
34,000	34,000	.00225	.00010	-----	-----	
35,000	35,000	.00242	.00017	.00071	.00041	
36,000	36,000	.00262	.00020	-----	-----	
37,000	37,000	.00282	.00020	-----	-----	
38,000	38,000	.00300	.00018	-----	-----	
39,000	39,000	.00325	.00025	-----	-----	
40,000	40,000	.00380	.00055	.00168	.00097	Ultimate strength.
55,610	55,610	-----	-----	-----	-----	

Failed by triple flexure.

No. 822.

Marks,  $^{12}M$   $^{R_2}$   $T R_2$   
 $^{B R_{10}}$ 

Length, 10."

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00016	.00004	0.	.....	
6,000	6,000	.00020	.00004	.....	.....	
7,000	7,000	.00024	.00004	.....	.....	
8,000	8,000	.00030	.00006	.....	.....	
9,000	9,000	.00034	.00004	.....	.....	
10,000	10,000	.00040	.00006	0.	.....	
11,000	11,000	.00044	.00004	.....	.....	
12,000	12,000	.00050	.00006	.....	.....	
13,000	13,000	.00054	.00004	.....	.....	
14,000	14,000	.00060	.00006	.....	.....	
15,000	15,000	.00066	.00006	.00002	.00002	
16,000	16,000	.00070	.00004	.....	.....	
17,000	17,000	.00076	.00006	.....	.....	
18,000	18,000	.00080	.00004	.....	.....	
19,000	19,000	.00088	.00008	.....	.....	
20,000	20,000	.00092	.00004	.00006	.00004	
21,000	21,000	.00100	.00008	.....	.....	
22,000	22,000	.00106	.00006	.....	.....	
23,000	23,000	.00114	.00008	.....	.....	
24,000	24,000	.00120	.00006	.....	.....	
25,000	25,000	.00124	.00004	.00012	.00006	
26,000	26,000	.00134	.00010	.....	.....	
27,000	27,000	.00140	.00006	.....	.....	
28,000	28,000	.00146	.00006	.....	.....	
29,000	29,000	.00156	.00010	.....	.....	
30,000	30,000	.00164	.00008	.00026	.00014	
31,000	31,000	.00176	.00012	.....	.....	
32,000	32,000	.00186	.00010	.....	.....	
33,000	33,000	.00196	.00010	.....	.....	
34,000	34,000	.00210	.00014	.....	.....	
35,000	35,000	.00224	.00014	.00058	.00032	
36,000	36,000	.00244	.00020	.....	.....	
37,000	37,000	.00268	.00024	.....	.....	
38,000	38,000	.00290	.00022	.....	.....	
39,000	39,000	.00320	.00030	.....	.....	
40,000	40,000	.00360	.00040	.00160	.00102	
65,300	65,300	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 10.

No. 3911.

Marks,  $^{12} M R_{10} T R_1$   
 $M T_1$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040	.....	.....	
3,000	3,000	.000080	.000080	.....	.....	
4,000	4,000	.000120	.000040	.....	.....	
5,000	5,000	.000160	.000040	.000005	.000005	
6,000	6,000	.000200	.000040	.....	.....	
7,000	7,000	.000265	.000065	.....	.....	
8,000	8,000	.000320	.000055	.....	.....	
9,000	9,000	.000380	.000060	.....	.....	
10,000	10,000	.000435	.000055	.000010	.000015	
11,000	11,000	.000490	.000055	.....	.....	
12,000	12,000	.000545	.000055	.000020	.000020	
13,000	13,000	.000605	.000060	.....	.....	
14,000	14,000	.000675	.000070	.000040	.000020	
15,000	15,000	.000745	.000070	.....	.....	
16,000	16,000	.000810	.000065	.000065	.000025	
17,000	17,000	.000880	.000070	.....	.....	
18,000	18,000	.000950	.000070	.000085	.000020	
19,000	19,000	.001030	.000080	.....	.....	
20,000	20,000	.001095	.000065	.000105	.000020	
21,000	21,000	.001185	.000090	.....	.....	
22,000	22,000	.001260	.000075	.000155	.000050	
23,000	23,000	.001355	.000095	.....	.....	
24,000	24,000	.001445	.000090	.000215	.000090	
25,000	25,000	.001570	.000075	.000270	.000055	
31,540	31,540	.....	.....	.....	.....	Tensile strength.

Fractured 2" from neck.

Appearance, granular.

Specific gravity, 7.2866.

Hardness, 18.48.



No. 3912.

Marks,  $^{12} M R_{10} T R_2$   
 $^B T_2$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000160	.000055	.....	.....	
5,000	5,000	.000200	.000040	— .000005	— .000005	
6,000	6,000	.000245	.000045	.....	.....	
7,000	7,000	.001280	.000035	.....	.....	
8,000	8,000	.000325	.000045	.....	.....	
9,000	9,000	.000380	.000055	.....	.....	
10,000	10,000	.000445	.000065	— .000015	— .000010	
11,000	11,000	.000500	.000055	.....	.....	
12,000	12,000	.000565	.000065	0.	.000015	
13,000	13,000	.000640	.000075	.....	.....	
14,000	14,000	.000705	.000065	.000040	.000040	
15,000	15,000	.000790	.000085	.....	.....	
16,000	16,000	.000865	.000075	.000065	.000025	
17,000	17,000	.000940	.000075	.....	.....	
18,000	18,000	.001030	.000090	.000110	.000055	
19,000	19,000	.001125	.000095	.....	.....	
20,000	20,000	.001215	.000090	.000180	.000070	
21,000	21,000	.001330	.000115	.....	.....	
22,000	22,000	.001450	.000120	.000270	.000090	
23,000	23,000	.001600	.000150	.....	.....	
24,000	24,000	.001755	.000155	.000435	.000165	
25,000	25,000	.001980	.000225	.000575	.000140	
29,850	29,850	.....	.....	.....	.....	Tensile strength.

Fractured 3".75 from neck.

Appearance, granular.

Specific gravity, 7.2838.

Hardness, 16.56.

No. 823.

Marks,  $12 M R_{10} T R_2$   
 $B T_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00015	.....	.....	
4,000	4,000	.00014	.00014	.....	.....	
5,000	5,000	.00019	.00015	0.	.....	
6,000	6,000	.00024	.00015	.....	.....	
7,000	7,000	.00030	.00016	.....	.....	
8,000	8,000	.00036	.00016	.....	.....	
9,000	9,000	.00041	.00015	.....	.....	
10,000	10,000	.00047	.00016	.00001	.00001	
11,000	11,000	.00052	.00015	.....	.....	
12,000	12,000	.00058	.00016	.....	.....	
13,000	13,000	.00063	.00015	.....	.....	
14,000	14,000	.00068	.00015	.....	.....	
15,000	15,000	.00073	.00015	.00005	.00004	
16,000	16,000	.00080	.00017	.....	.....	
17,000	17,000	.00087	.00017	.....	.....	
18,000	18,000	.00093	.00016	.....	.....	
19,000	19,000	.00098	.00015	.....	.....	
20,000	20,000	.00103	.00015	.00009	.00004	
21,000	21,000	.00109	.00016	.....	.....	
22,000	22,000	.00117	.00016	.....	.....	
23,000	23,000	.00122	.00015	.....	.....	
24,000	24,000	.00129	.00017	.....	.....	
25,000	25,000	.00136	.00017	.00017	.00018	
26,000	26,000	.00143	.00017	.....	.....	
27,000	27,000	.00151	.00018	.....	.....	
28,000	28,000	.00158	.00017	.....	.....	
29,000	29,000	.00167	.00019	.....	.....	
30,000	30,000	.00177	.00010	.00033	.00016	
31,000	31,000	.00189	.00012	.....	.....	
32,000	32,000	.00200	.00011	.....	.....	
33,000	33,000	.00213	.00013	.....	.....	
34,000	34,000	.00229	.00016	.....	.....	
35,000	35,000	.00245	.00016	.00075	.00042	
36,000	36,000	.00270	.00225	.....	.....	
37,000	37,000	.00288	.00018	.....	.....	
38,000	38,000	.00309	.00021	.....	.....	
39,000	39,000	.00340	.00031	.....	.....	
40,000	40,000	.00370	.00030	.00174	.00099	
56,400	56,400	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 824.

Marks,  $^{12}M R_{10} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00002	.00002	.....	.....	
3,000	3,000	.00006	.00004	.....	.....	
4,000	4,000	.00012	.00006	.....	.....	
5,000	5,000	.00016	.00004	0.	.....	
6,000	6,000	.00020	.00004	.....	.....	
7,000	7,000	.00024	.00004	.....	.....	
8,000	8,000	.00030	.00006	.....	.....	
9,000	9,000	.00036	.00006	.....	.....	
10,000	10,000	.00042	.00006	0.	.....	
11,000	11,000	.00046	.00004	.....	.....	
12,000	12,000	.00052	.00006	.....	.....	
13,000	13,000	.00058	.00006	.....	.....	
14,000	14,000	.00062	.00004	.....	.....	
15,000	15,000	.00068	.00006	.00002	.00002	
16,000	16,000	.00072	.00004	.....	.....	
17,000	17,000	.00078	.00006	.....	.....	
18,000	18,000	.00084	.00006	.....	.....	
19,000	19,000	.00090	.00006	.....	.....	
20,000	20,000	.00096	.00006	.00010	.00008	
21,000	21,000	.00104	.00008	.....	.....	
22,000	22,000	.00110	.00006	.....	.....	
23,000	23,000	.00116	.00006	.....	.....	
24,000	24,000	.00124	.00008	.....	.....	
25,000	25,000	.00132	.00008	.00018	.00008	
26,000	26,000	.00142	.00010	.....	.....	
27,000	27,000	.00148	.00006	.....	.....	
28,000	28,000	.00156	.00008	.....	.....	
29,000	29,000	.00164	.00008	.....	.....	
30,000	30,000	.00174	.00010	.00036	.00018	
31,000	31,000	.00188	.00014	.....	.....	
32,000	32,000	.00196	.00008	.....	.....	
33,000	33,000	.00208	.00012	.....	.....	
34,000	34,000	.00222	.00014	.....	.....	
35,000	35,000	.00242	.00020	.00076	.00040	
36,000	36,000	.00261	.00022	.....	.....	
37,000	37,000	.00284	.00020	.....	.....	
38,000	38,000	.00312	.00028	.....	.....	
39,000	39,000	.00342	.00030	.....	.....	
40,000	40,000	.00378	.00036	.00186	.00110	
44,900	64,900	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 11.

No. 3976.

Marks, <sup>12 M R<sub>11</sub> 1 T R<sub>1</sub></sup><sub>M T<sub>1</sub></sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000045	.000045			
3,000	3,000	.000095	.000050			
4,000	4,000	.000145	.000050			
5,000	5,000	.000200	.000055	0.		
6,000	6,000	.000245	.000015			
7,000	7,000	.000300	.000015			
8,000	8,000	.000345	.000045			
9,000	9,000	.000395	.000050			
10,000	10,000	.000455	.000060	.000065	.000005	
11,000	11,000	.000505	.000050			
12,000	12,000	.000560	.000055	.000015	.000010	
13,000	13,000	.000620	.000060			
14,000	14,000	.000680	.000060	.000040	.000025	
15,000	15,000	.000745	.000065			
16,000	16,000	.000800	.000055	.000050	.000010	
17,000	17,000	.000865	.000065			
18,000	18,000	.000940	.000075	.000085	.000035	
19,000	19,000	.001015	.000075			
20,000	20,000	.001100	.000085	.000120	.000035	
21,000	21,000	.001190	.000080			Tensile strength.
22,000	22,000	.001290	.000090	.000190	.000070	
23,000	23,000	.001390	.000100			
24,000	24,000	.001490	.000100	.000270	.000080	
25,000	25,000	.001640	.000150	.000345	.000075	
29,580	29,980	.....	.....	.....	.....	

Fractured 3".5 from neck.

Appearance, granular, mottled.

No. 3977.

Marks,  $^{12} M R_{11} T R_1$  $M T_3$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000090	.000040	.....	.....	
4,000	4,000	.000140	.000050	.....	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000240	.000050	.....	.....	
7,000	7,000	.000290	.000050	.....	.....	
8,000	8,000	.000340	.000050	.....	.....	
9,000	9,000	.000395	.000055	.....	.....	
10,000	10,000	.000450	.000055	.000010	.000010	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000560	.000060	.000020	.000010	
13,000	13,000	.000610	.000050	.....	.....	
14,000	14,000	.000680	.000070	.000040	.000020	
15,000	15,000	.000740	.000060	.....	.....	
16,000	16,000	.000800	.000060	.000060	.000020	
17,000	17,000	.000860	.000060	.....	.....	
18,000	18,000	.000940	.000080	.000095	.000035	
19,000	19,000	.001005	.000065	.....	.....	
20,000	20,000	.001090	.000035	.000135	.000040	
21,000	21,000	.001185	.000095	.....	.....	
22,000	22,000	.001270	.000085	.000200	.000065	
23,000	23,000	.001365	.000095	.....	.....	
24,000	24,000	.001470	.000105	.000275	.000075	
24,900	24,900	.....	.....	.....	.....	Tensile strength.

Fractured at neck.

Appearance, granular mottled.

## TENACITY SPECIMENS.

General marks,  $^{12} M R_{11} T R_1$ .

No. of test.	Numbers.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3078	$M T_3 I$	1.129	1.00	39,180	39,180	7.3544	18.98
3079	$M T_4 O$	1.129	1.00	36,220	36,220	7.3520	17.62
3080	$M T_5 M$	1.129	1.00	32,470	32,470	7.3193	17.99
3081	$M T_6 I$	1.129	1.00	35,790	35,790	.....	.....
3082	$M T_7 O$	1.129	1.00	33,260	33,260	.....	.....
3083	$M T_8 O$	1.129	1.00	33,100	33,100	7.3135	16.56

Appearance of fracture, granular mottled.

H. Ex. 165—15

No. 827.

Marks, <sup>12 M R<sub>11</sub> T R<sub>1</sub></sup>  
<sub>M T<sub>9</sub></sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000100	.000040	.....	.....	
4,000	4,000	.000130	.000030	.....	.....	
5,000	5,000	.000180	.000050	0.	0.	
6,000	6,000	.000230	.000050	.....	.....	
7,000	7,000	.000280	.000050	.....	.....	
8,000	8,000	.000330	.000050	.....	.....	
9,000	9,000	.000380	.000050	.....	.....	
10,000	10,000	.000430	.000050	.000010	.000010	
11,000	11,000	.000490	.000060	.....	.....	
12,000	12,000	.000560	.000070	.....	.....	
13,000	13,000	.000600	.000040	.....	.....	
14,000	14,000	.000660	.000060	.....	.....	
15,000	15,000	.000710	.000050	.000060	.000050	
16,000	16,000	.000770	.000060	.....	.....	
17,000	17,000	.000820	.000050	.....	.....	
18,000	18,000	.000880	.000060	.....	.....	
19,000	19,000	.000920	.000040	.....	.....	
20,000	20,000	.000980	.000060	.000090	.000030	
21,000	21,000	.001030	.000050	.....	.....	
22,000	22,000	.001100	.000070	.....	.....	
23,000	23,000	.001160	.000060	.....	.....	
24,000	24,000	.001210	.000050	.....	.....	
25,000	25,000	.001290	.000080	.000170	.000080	
26,000	26,000	.001360	.000070	.....	.....	
27,000	27,000	.001410	.000050	.....	.....	
28,000	28,000	.001500	.000090	.....	.....	
29,000	29,000	.001570	.000070	.....	.....	
30,000	30,000	.001660	.000090	.000280	.000110	
31,000	31,000	.001740	.000080	.....	.....	
32,000	32,000	.001810	.000070	.....	.....	
33,000	33,000	.001910	.000100	.....	.....	
34,000	34,000	.002040	.000130	.....	.....	
35,000	35,000	.002210	.000170	.000570	.000290	
36,000	36,000	.002320	.000110	.....	.....	
37,000	37,000	.002500	.000180	.....	.....	
38,000	38,000	.002680	.000180	.....	.....	
39,000	39,000	.002910	.000230	.....	.....	
40,000	40,000	.003130	.000220	.001300	.000730	
56,050	56,050	.....	.....	.....	.....	Ultimate strength.

Triple flexure.

No. 828.

Marks, 12 M R<sub>11</sub> T R,  
M T<sub>10</sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compres- sion per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000190	.000040	0.	0.	
6,000	6,000	.000240	.000050	.....	.....	
7,000	7,000	.000300	.000060	.....	.....	
8,000	8,000	.000360	.000060	.....	.....	
9,000	9,000	.000400	.000040	.....	.....	
10,000	10,000	.000460	.000050	.000030	.000030	
11,000	11,000	.000500	.000040	.....	.....	
12,000	12,000	.000560	.000060	.....	.....	
13,000	13,000	.000610	.000050	.....	.....	
14,000	14,000	.000670	.000060	.....	.....	
15,000	15,000	.000710	.000040	.000070	.000040	
16,000	16,000	.000790	.000080	.....	.....	
17,000	17,000	.000850	.000060	.....	.....	
18,000	18,000	.000890	.000040	.....	.....	
19,000	19,000	.000960	.000070	.....	.....	
20,000	20,000	.001010	.000050	.000110	.000040	
21,000	21,000	.001090	.000080	.....	.....	
22,000	22,000	.001160	.000070	.....	.....	
23,000	23,000	.001210	.000050	.....	.....	
24,000	24,000	.001290	.000080	.....	.....	
25,000	25,000	.001360	.000070	.000190	.000080	
26,000	26,000	.001420	.000060	.....	.....	
27,000	27,000	.001500	.000080	.....	.....	
28,000	28,000	.001590	.000090	.....	.....	
29,000	29,000	.001680	.000090	.....	.....	
30,000	30,000	.001790	.000110	.000300	.000200	
31,000	31,000	.001920	.000130	.....	.....	
32,000	32,000	.002060	.000140	.....	.....	
33,000	33,000	.002200	.000140	.....	.....	
34,000	34,000	.002360	.000160	.....	.....	
35,000	35,000	.002600	.000240	.000360	.000570	
36,000	36,000	.002790	.000190	.....	.....	
37,000	37,000	.003080	.000290	.....	.....	
38,000	38,000	.003330	.000250	.....	.....	
39,000	39,000	.003660	.000330	.....	.....	
40,000	40,000	.004090	.000430	.002170	.001210	
53,950	53,950	.....	.....	.....	.....	Ultimate strength.

Triple flexure.

No. 3913.

Marks, <sup>12 M R<sub>1</sub> T R<sub>2</sub></sup>  
<sub>B 1<sub>1</sub></sub>Diameter, 1<sup>1</sup>/<sub>16</sub>.129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000			0.	0.	Initial load.
2,000	2,000	.001050	.000050			
3,000	3,000	.000095	.000045			
4,000	4,000	.000145	.000050			
5,000	5,000	.000200	.000055	0.	0.	
6,000	6,000	.000250	.000050			
7,000	7,000	.000310	.000060			
8,000	8,000	.000380	.000070			
9,000	9,000	.000440	.000060			
10,000	10,000	.000490	.000050	.000035	.000035	
11,000	11,000	.000545	.000055			
12,000	12,000	.000600	.000055	.000040	.000005	
13,000	13,000	.000680	.000080			
14,000	14,000	.000755	.000075	.000060	.000020	
15,000	15,000	.000830	.000075			
16,000	16,000	.000905	.000075	.000095	.000035	
17,000	17,000	.000990	.000085			
18,000	18,000	.001060	.000100	.000145	.000050	
19,000	19,000	.001185	.000085			
20,000	20,000	.001290	.000105	.000220	.000075	
21,000	21,000	.001405	.000115			
22,000	22,000	.001535	.000130	.000340	.000120	
23,000	23,000	.001730	.000190			
24,000	24,000	.001900	.000170	.000350	.000210	
25,000	25,000	.002130	.000230	.000700	.000150	
32,290	32,290					Tensile strength.

Fractured at middle of stem.

Appearance, granular.

Specific gravity, 7.3136.

Hardness, 15.43.



No. 3914.

Marks,  $^{12} M R_{11} T R_2$   
 $B T_2$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000160	.000060	.....	.....	
5,000	5,000	.000205	.000045	0.	0.	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000315	.000060	.....	.....	
8,000	8,000	.000380	.000065	.....	.....	
9,000	9,000	.000440	.000060	.....	.....	
10,000	10,000	.000490	.000450	.000030	.00.030	
11,000	11,000	.000550	.000060	.....	.....	
12,000	12,000	.000615	.000065	.000050	.000020	
13,000	13,000	.000690	.000075	.....	.....	
14,000	14,000	.000750	.000080	.000060	.000010	
15,000	15,000	.000830	.000080	.....	.....	
16,000	16,000	.000895	.000065	.000100	.000040	
17,000	17,000	.000990	.000095	.....	.....	
18,000	18,000	.001080	.000070	.000145	.000045	
19,000	19,000	.001155	.000095	.....	.....	
20,000	20,000	.001265	.000110	.000210	.000065	Tensile strength.
21,000	21,000	.001395	.000130	.....	.....	
22,000	22,000	.001110	.000115	.000335	.000125	
23,000	23,000	.001870	.000160	.....	.....	
24,000	24,000	.001845	.000175	.000315	.000180	
25,000	25,000	.002050	.000205	.000650	.000135	
30,040	30,040	.....	.....	.....	.....	

Fractured  $2\frac{1}{2}$ " from neck.

Appearance granular.

No. 825.

Marks,  $^{12}M R_1 T R_2$   
 $B T_3$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000030	.000030	.....	.....	
3,000	3,000	.000080	.000030	.....	.....	
4,000	4,000	.000130	.000050	.....	.....	
5,000	5,000	.000180	.000050	0.	0.	
6,000	6,000	.000230	.000050	.....	.....	
7,000	7,000	.000280	.000050	.....	.....	
8,000	8,000	.000330	.000050	.....	.....	
9,000	9,000	.000390	.000060	.....	.....	
10,000	10,000	.000440	.000050	.000010	.000010	
11,000	11,000	.000500	.000060	.....	.....	
12,000	12,000	.000540	.000040	.....	.....	
13,000	13,000	.000600	.000060	.....	.....	
14,000	14,000	.000670	.000070	.....	.....	
15,000	15,000	.000710	.000040	.000060	.000050	
16,000	16,000	.000780	.000070	.....	.....	
17,000	17,000	.000830	.000050	.....	.....	
18,000	18,000	.000900	.000070	.....	.....	
19,000	19,000	.000960	.000060	.....	.....	
20,000	20,000	.001010	.000050	.000100	.000040	
21,000	21,000	.001070	.000060	.....	.....	
22,000	22,000	.001130	.000060	.....	.....	
23,000	23,000	.001200	.000070	.....	.....	
24,000	24,000	.001280	.000080	.....	.....	
25,000	25,000	.001370	.000090	.000200	.000100	
26,000	26,000	.001430	.000060	.....	.....	
27,000	27,000	.001510	.000080	.....	.....	
28,000	28,000	.001600	.000090	.....	.....	
29,000	29,000	.001700	.000100	.....	.....	
30,000	30,000	.001810	.000110	.000410	.000210	
31,000	31,000	.001930	.000120	.....	.....	
32,000	32,000	.002060	.000130	.....	.....	
33,000	33,000	.002180	.000120	.....	.....	
34,000	34,000	.002360	.000180	.....	.....	
35,000	35,000	.002580	.000220	.000920	.000510	
36,000	36,000	.002810	.000230	.....	.....	
37,000	37,000	.003080	.000270	.....	.....	
38,000	38,000	.003390	.000310	.....	.....	
39,000	39,000	.003720	.000330	.....	.....	
40,000	40,000	.004180	.000460	.002220	.001300	
53,800	53,800	.....	.....	.....	.....	Ultimate strength.

Triple flexure.

No. 826.

Marks,  $12 M R_{11} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040			
3,000	3,000	.000100	.000060			
4,000	4,000	.000140	.000040			
5,000	5,000	.000200	.000080			
6,000	6,000	.000240	.000040	0.	0.	
7,000	7,000	.000280	.000040			
8,000	8,000	.000340	.000060			
9,000	9,000	.000380	.000040			
10,000	10,000	.000440	.000060	0.	0.	
11,000	11,000	.000500	.000060			
12,000	12,000	.000560	.000060			
13,000	13,000	.000620	.000060			
14,000	14,000	.000660	.000040			
15,000	15,000	.000700	.000040	.000060	.000060	
16,000	16,000	.000740	.000040			
17,000	17,000	.000780	.000040			
18,000	18,000	.000860	.000080			
19,000	19,000	.000940	.000080			
20,000	20,000	.001000	.000060	.000080	.000020	
21,000	21,000	.001040	.000040			
22,000	22,000	.001100	.000060			
23,000	23,000	.001160	.000060			
24,000	24,000	.001240	.000080			
25,000	25,000	.001320	.000080	.000160	.000080	
26,000	26,000	.001400	.000080			
27,000	27,000	.001460	.000060			
28,000	28,000	.001560	.000100			
29,000	29,000	.001700	.000140			
30,000	30,000	.001800	.000100	.000400	.000240	
31,000	31,000	.001960	.000160			
32,000	32,000	.002080	.000120			
33,000	33,000	.002240	.000160			
34,000	34,000	.002400	.000160			
35,000	35,000	.002720	.000320	.001240	.000840	
36,000	36,000	.003000	.000280			
37,000	37,000	.003240	.000240			
38,000	38,000	.003540	.000300			
39,000	39,000	.003940	.000400			
40,000	40,000	.004440	.000500	.002460	.001220	
62,800	62,800					Ultimate strength.

Triple flexure.

## CAST-IRON BODY, No. 12.

No. 3980.

Marks, <sup>12 M R<sub>12</sub> T R<sub>1</sub></sup>  
<sub>M T<sub>1</sub></sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040	-----	-----	
3,000	3,000	.000090	.000050	-----	-----	
4,000	4,000	.000140	.000050	-----	-----	
5,000	5,000	.000195	.000055	0.	-----	
6,000	6,000	.000245	.000050	-----	-----	
7,000	7,000	.000300	.000055	-----	-----	
8,000	8,000	.000350	.000050	-----	-----	
9,000	9,000	.000405	.000055	-----	-----	
10,000	10,000	.000455	.000050	.000005	.000005	
11,000	11,000	.000510	.000055	-----	-----	
12,000	12,000	.000570	.000060	.000015	.000015	
13,000	13,000	.000635	.000065	-----	-----	
14,000	14,000	.000695	.000060	.000035	.000020	
15,000	15,000	.000755	.000060	-----	-----	
16,000	16,000	.000815	.000060	.000050	.000015	
17,000	17,000	.000890	.000075	-----	-----	
18,000	18,000	.000960	.000070	.000070	.000020	
19,000	19,000	.001040	.000080	-----	-----	
20,000	20,000	.001105	.000065	.000100	.000030	
21,000	21,000	.001190	.000085	-----	-----	
22,000	22,000	.001290	.000100	.000150	.000050	
23,000	23,000	.001385	.000095	-----	-----	
24,000	24,000	.001485	.000100	.000205	.000055	
25,000	25,000	.001600	.000115	.000255	.000050	
29,210	29,210	-----	-----	-----	-----	Tensile strength.

Fractured  $\frac{5}{8}$ " from neck.

Appearance, uniform granular.

Specific gravity, 7.2767.

Hardness, 18.58.

No. 3981.

Marks,  $^{12} M R_{12} T R_1$   
 $M T_{12}$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000150	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000205	.000055	0.	.....	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000310	.000055	.....	.....	
8,000	8,000	.000365	.000055	.....	.....	
9,000	9,000	.000420	.000055	.....	.....	
10,000	10,000	.000480	.000060	.000010	.000010	
11,000	11,000	.000540	.000060	.....	.....	
12,000	12,000	.000600	.000060	.000030	.000020	
13,000	13,000	.000655	.000055	.....	.....	
14,000	14,000	.000715	.000060	.000040	.000010	
15,000	15,000	.000710	.000075	.....	.....	
16,000	16,000	.000850	.000060	.000050	.000010	
17,000	17,000	.000910	.000060	.....	.....	
18,000	18,000	.000980	.000080	.000070	.000020	
19,000	19,000	.001055	.000085	.....	.....	
20,000	20,000	.001140	.000085	.000100	.000030	
21,000	21,000	.001210	.000070	.....	.....	
22,000	22,000	.001285	.000085	.000140	.000040	
23,000	23,000	.001390	.000095	.....	.....	
24,000	24,000	.001490	.000100	.000195	.000055	
25,000	25,000	.001590	.000100	.000240	.000045	
31,800	31,800	.....	.....	.....	.....	Tensile strength.

Fractured  $1\frac{3}{4}$ " from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $M R_{12} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3090	$M T_3 I$	1.129	1.00	33,580	33,580	7.2804	20.03
3091	$M T_3 O$	1.129	1.00	30,010	30,010	7.2736	18.58
3092	$M T_3 M$	1.129	1.00	33,100	33,100	7.2943	20.47
3093	$M T_5 I$	1.129	1.00	32,710	32,710	.....	.....
3094	$M T_5 O$	1.129	1.00	32,240	32,240	.....	.....
3095	$M T_5 O$	1.129	1.00	33,490	33,490	.....	.....

Appearance of fractures, uniform granular.

## No. 831.

Marks,  $^{12}M R_{12} T R_1$   
 $^{MT}_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00047	.00006	.00002	.00002	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00065	.00007	.....	.....	
14,000	14,000	.00071	.00006	.....	.....	
15,000	15,000	.00075	.00004	.00008	.00006	
16,000	16,000	.00081	.00006	.....	.....	
17,000	17,000	.00087	.00006	.....	.....	
18,000	18,000	.00092	.00005	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00103	.00005	.00010	.00002	
21,000	21,000	.00109	.00006	.....	.....	
22,000	22,000	.00115	.00006	.....	.....	
23,000	23,000	.00121	.00006	.....	.....	
24,000	24,000	.00128	.00007	.....	.....	
25,000	25,000	.00133	.00005	.00017	.00007	
26,000	26,000	.00140	.00007	.....	.....	
27,000	27,000	.00147	.00007	.....	.....	
28,000	28,000	.00152	.00005	.....	.....	
29,000	29,000	.00160	.00008	.....	.....	
30,000	30,000	.00168	.00008	.00023	.00006	
31,000	31,000	.00174	.00006	.....	.....	
32,000	32,000	.00182	.00008	.....	.....	
33,000	33,000	.00190	.00008	.....	.....	
34,000	34,000	.00199	.00009	.....	.....	
35,000	35,000	.00208	.00009	.00040	.00017	
36,000	36,000	.00220	.00012	.....	.....	
37,000	37,000	.00230	.00010	.....	.....	
38,000	38,000	.00242	.00012	.....	.....	
39,000	39,000	.00253	.00011	.....	.....	
40,000	40,000	.00271	.00018	.00076	.00036	
61,750	61,750	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 832.

Marks,  $^{12}M R_{12} T R_1$ Length,  $12''$ .Diameter,  $1''.129$ .

Sectional area, 1 square inch.

Gauged length,  $10''$ .

Applied loads.		Compression per inch.	Successive compression per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	-----	-----	
3,000	3,000	.00012	.00006	-----	-----	
4,000	4,000	.00017	.00005	-----	-----	
5,000	5,000	.00022	.00005	.00001	.00001	
6,000	6,000	.00027	.00005	-----	-----	
7,000	7,000	.00032	.00005	-----	-----	
8,000	8,000	.00038	.00006	-----	-----	
9,000	9,000	.00043	.00005	-----	-----	
10,000	10,000	.00049	.00006	.00007	.00007	
11,000	11,000	.00054	.00005	-----	-----	
12,000	12,000	.00059	.00005	-----	-----	
13,000	13,000	.00065	.00006	-----	-----	
14,000	14,000	.00070	.00005	-----	-----	
15,000	15,000	.00078	.00008	.00009	.00002	
16,000	16,000	.00083	.00005	-----	-----	
17,000	17,000	.00089	.00006	-----	-----	
18,000	18,000	.00094	.00005	-----	-----	
19,000	19,000	.00099	.00005	-----	-----	
20,000	20,000	.00105	.00006	.00012	.00003	
21,000	21,000	.00111	.00006	-----	-----	
22,000	22,000	.00117	.00006	-----	-----	
23,000	23,000	.00123	.00006	-----	-----	
24,000	24,000	.00130	.00007	-----	-----	
25,000	25,000	.00136	.00006	.00019	.00007	
26,000	26,000	.00142	.00006	-----	-----	
27,000	27,000	.00148	.00006	-----	-----	
28,000	28,000	.00154	.00006	-----	-----	
29,000	29,000	.00161	.00007	-----	-----	
30,000	30,000	.00170	.00009	.00028	.00009	
31,000	31,000	.00178	.00008	-----	-----	
32,000	32,000	.00183	.00005	-----	-----	
33,000	33,000	.00190	.00007	-----	-----	
34,000	34,000	.00199	.00009	-----	-----	
35,000	35,000	.00216	.00011	.00041	.00013	
36,000	36,000	.00222	.00012	-----	-----	
37,000	37,000	.00235	.00013	-----	-----	
38,000	38,000	.00248	.00013	-----	-----	
39,000	39,000	.00260	.00012	-----	-----	
40,000	40,000	.00279	.00019	.00082	.00041	
60,620	60,620	-----	-----	-----	-----	Ultimate strength.

No. 3978.

Marks, <sup>12</sup>M <sup>R<sub>10</sub></sup><sub>B<sup>T</sup><sub>1</sub></sub> <sup>T</sup>R<sub>2</sub>Diameter, 1<sup>11</sup>/<sub>16</sub>.129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000135	.000075	.....	.....	
4,000	4,000	.000185	.000050	.....	.....	
5,000	5,000	.000245	.000060	.000015	.000015	
6,000	6,000	.000295	.000050	.....	.....	
7,000	7,000	.000355	.000060	.....	.....	
8,000	8,000	.000430	.000075	.....	.....	
9,000	9,000	.000495	.000065	.....	.....	
10,000	10,000	.000565	.000070	.000045	.000030	
11,000	11,000	.000640	.000075	.....	.....	
12,000	12,000	.000710	.000070	.000055	.000010	
13,000	13,000	.000790	.000080	.....	.....	
14,000	14,000	.000880	.000090	.000090	.000035	
15,000	15,000	.000970	.000090	.....	.....	
16,000	16,000	.001070	.000100	.000140	.000050	
17,000	17,000	.001160	.000090	.....	.....	
18,000	18,000	.001275	.000115	.000205	.000065	
19,000	19,000	.001400	.000125	.....	.....	
20,000	20,000	.001560	.000160	.000335	.000130	
21,000	21,000	.001710	.000150	.....	.....	
22,000	22,000	.001890	.000180	.000490	.000155	
23,000	23,000	.002140	.000250	.....	.....	
24,000	24,000	.002390	.000250	.000810	.000320	
25,000	25,000	.002750	.000360	.001055	.000245	
26,270	26,270	.....	.....	.....	.....	Tensile strength.

Fractured 6" from neck.

Appearance, uniform granular.

Specific gravity, 7.2810.

Hardness, 15 43



No. 3979.

Marks, 12 M R<sub>12</sub> T R<sub>2</sub>  
B T<sub>2</sub>

Diameter, 1 1/2".129.

Sectional area, 1 square inch.

Gauged length, 20".

Length of stem, 23".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055			
3,000	3,000	.000110	.000055			
4,000	4,000	.000165	.000055			
5,000	5,000	.000225	.000060	.000005	.000005	
6,000	6,000	.000290	.000065			
7,000	7,000	.000350	.000060			
8,000	8,000	.000410	.000060			
9,000	9,000	.000490	.000080			
10,000	10,000	.000555	.000065	.000040	.000035	
11,000	11,000	.000620	.000065			
12,000	12,000	.000695	.000065	.000050	.000010	
13,000	13,000	.000780	.000085			
14,000	14,000	.000860	.000080	.000080	.000030	
15,000	15,000	.000945	.000085			
16,000	16,000	.001050	.000105	.000115	.000035	
17,000	17,000	.001150	.000100			
18,000	18,000	.001255	.000105	.000190	.000075	
19,000	19,000	.001395	.000140			
20,000	20,000	.001515	.000120	.000290	.000100	
21,000	21,000	.001600	.000145			
22,000	22,000	.001850	.000190	.000460	.000170	
23,000	23,000	.002085	.000235			Tensile strength.
24,000	24,000	.002350	.000265	.000760	.000300	
25,000	25,000	.002685	.000335	.001000	.000240	
27,360	27,360					

Fractured 4" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks, 12 M R<sub>12</sub> T R<sub>2</sub>.

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3084	B T <sub>2</sub> I	1.129	1.00	28,320	28,320		
3085	B T <sub>2</sub> O	1.129	1.00	32,480	32,480		
3086	B T <sub>2</sub> M	1.129	1.00	29,910	29,910		
3087	B L <sub>2</sub> I	1.129	1.00	29,300	29,300	7.2832	15.75
				Upper end.	Upper end.	7.2792	15.43
3088	B L <sub>2</sub> O	1.129	1.00	29,490	29,490	7.2786	15.59
				Upper end.	Upper end.	7.2806	16.23
3089	B L <sub>2</sub> M	1.129	1.00	29,150	29,150	7.2755	15.91
				Upper end.	Upper end.	7.2730	14.61

Appearance of fractures, uniform granular.

No. 829.

Marks.  $12 M R_{12} T R_2$   
B T<sub>9</sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00001	.00004	.....	.....	
3,000	3,000	.00009	.00005	.....	.....	
4,000	4,000	.00016	.00007	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00027	.00007	.....	.....	
7,000	7,000	.00031	.00004	.....	.....	
8,000	8,000	.00038	.00007	.....	.....	
9,000	9,000	.00043	.00005	.....	.....	
10,000	10,000	.00049	.00006	.00001	.0001	
11,000	11,000	.00056	.00007	.....	.....	
12,000	12,000	.00061	.00005	.....	.....	
13,000	13,000	.00070	.00009	.....	.....	
14,000	14,000	.00077	.00007	.....	.....	
15,000	15,000	.00082	.00005	.00009	.00008	
16,000	16,000	.00088	.00006	.....	.....	
17,000	17,000	.00093	.00005	.....	.....	
18,000	18,000	.00099	.00008	.....	.....	
19,000	19,000	.00107	.00008	.....	.....	
20,000	20,000	.00114	.00007	.00013	.00004	
21,000	21,000	.00120	.00006	.....	.....	
22,000	22,000	.00129	.00009	.....	.....	
23,000	23,000	.00137	.00008	.....	.....	
24,000	24,000	.00143	.00006	.....	.....	
25,000	25,000	.00151	.00008	.00023	.00010	
26,000	26,000	.00160	.00009	.....	.....	
27,000	27,000	.00168	.00008	.....	.....	
28,000	28,000	.00178	.00010	.....	.....	
29,000	29,000	.00188	.00010	.....	.....	
30,000	30,000	.00200	.00012	.00043	.00020	
31,000	31,000	.00212	.00012	.....	.....	
32,000	32,000	.00225	.00013	.....	.....	
33,000	33,000	.00240	.00015	.....	.....	
34,000	34,000	.00258	.00018	.....	.....	
35,000	35,000	.00288	.00030	.00091	.00048	
36,000	36,000	.00301	.00013	.....	.....	
37,000	37,000	.00322	.00021	.....	.....	
38,000	38,000	.00347	.00025	.....	.....	
39,000	39,000	.00373	.00026	.....	.....	
40,000	40,000	.00418	.00045	.00201	.00110	
54,100	54,100	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 830.

Marks,  $12 M R_{12} T R_2$   
 $B R_{10}$ 

Length, 10''.

Diameter, 1''.129.

Sectional area, 1 square inch.

Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00030	.00004	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00054	.00006	.....	.....	
12,000	12,000	.00060	.00006	.....	.....	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00074	.00008	.....	.....	
15,000	15,000	.00078	.00004	.00008	.00006	
16,000	16,000	.00084	.00006	.....	.....	
17,000	17,000	.00092	.00008	.....	.....	
18,000	18,000	.00098	.00006	.....	.....	
19,000	19,000	.00104	.00006	.....	.....	
20,000	20,000	.00110	.00006	.00010	.00002	
21,000	21,000	.00116	.00006	.....	.....	
22,000	22,000	.00124	.00008	.....	.....	
23,000	23,000	.00132	.00008	.....	.....	
24,000	24,000	.00140	.00008	.....	.....	
25,000	25,000	.00148	.00008	.00022	.00012	
26,000	26,000	.00156	.00008	.....	.....	
27,000	27,000	.00166	.00010	.....	.....	
28,000	28,000	.00178	.00010	.....	.....	
29,000	29,000	.00186	.00010	.....	.....	
30,000	30,000	.00196	.00010	.00040	.00018	
31,000	31,000	.00210	.00014	.....	.....	
32,000	32,000	.00224	.00014	.....	.....	
33,000	33,000	.00236	.00012	.....	.....	
34,000	34,000	.00252	.00016	.....	.....	
35,000	35,000	.00276	.00024	.00090	.00050	
36,000	36,000	.00296	.00020	.....	.....	
37,000	37,000	.00312	.00016	.....	.....	
38,000	38,000	.00336	.00024	.....	.....	
39,000	39,000	.00368	.00032	.....	.....	
40,000	40,000	.00402	.00034	.00190	.00100	
61,950	61,980	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 13.

No. 3982.

Marks,  $^{12} M R_{13} T R_1$   
 $M T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000095	.000145	-----	-----	
4,000	4,000	.000150	.000255	-----	-----	
5,000	5,000	.000200	.000350	0.	-----	
6,000	6,000	.000250	.000450	-----	-----	
7,000	7,000	.000300	.000550	-----	-----	
8,000	8,000	.000350	.000650	-----	-----	
9,000	9,000	.000405	.000755	-----	-----	
10,000	10,000	.000460	.000855	.000015	.000015	
11,000	11,000	.000525	.000965	-----	-----	
12,000	12,000	.000585	.000960	.000035	.000020	
13,000	13,000	.000650	.000965	-----	-----	
14,000	14,000	.000710	.000960	.000055	.000020	
15,000	15,000	.000785	.000975	-----	-----	
16,000	16,000	.000850	.000965	.000085	.000030	
17,000	17,000	.000940	.000990	-----	-----	
18,000	18,000	.001020	.000980	.000120	.000035	
19,000	19,000	.001110	.000990	-----	-----	
20,000	20,000	.001210	.000100	.000190	.000070	
21,000	21,000	.001335	.000125	-----	-----	
22,000	22,000	.001440	.000105	.000285	.000095	
23,000	23,000	.001585	.000145	-----	-----	
24,000	24,000	.001735	.000150	.000435	.000150	
25,000	25,000	.001935	.000200	.000550	.000115	
29,640	29,640	-----	-----	-----	-----	Tensile strength.

Fractured  $2\frac{1}{2}$ " from neck.

Appearance, uniform granular.

Specific gravity, 7.2928.

Hardness, 15.99.

No. 3983.

Marks,  $12 M R_{13} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000305	.000055	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000415	.000060	.....	.....	
10,000	10,000	.000470	.000055	.000010	.000010	
11,000	11,000	.000535	.000065	.....	.....	
12,000	12,000	.000595	.000060	.000035	.000025	
13,000	13,000	.000655	.000060	.....	.....	
14,000	14,000	.000735	.000080	.000050	.000015	
15,000	15,000	.000795	.000060	.....	.....	
16,000	16,000	.000860	.000065	.000080	.000030	
17,000	17,000	.000950	.000090	.....	.....	
18,000	18,000	.001025	.000075	.000110	.000030	
19,000	19,000	.001115	.000090	.....	.....	
20,000	20,000	.001215	.000100	.000175	.000065	
21,000	21,000	.001310	.000095	.....	.....	
22,000	22,000	.001435	.000125	.000255	.000080	
23,000	23,000	.001565	.000130	.....	.....	
24,000	24,000	.001730	.000165	.000400	.000145	Tensile strength.
25,000	25,000	.001905	.000175	.000510	.000110	
29,590	29,590	.....	.....	.....	.....	

Fractured  $1\frac{1}{4}$ " from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{13} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		Inches.	Sq. inch.	Pounds.	Pounds.		
3096	$M T_2 I$	1.129	1.00	33,190	33,190	7.2904	17.35
3097	$M T_4 O$	1.129	1.00	32,640	32,640	7.2872	16.56
3098	$M T_5 M$	1.129	1.00	33,510	33,510	7.3001	16.73
3118	$M T_8 O X$	1.129	1.00	33,790	33,790	.....	.....

Appearance of fractures, uniform granular.

H. Ex. 165—16

No. 835.

Marks,  $12 M R_{13} T R_1$   
 $M T_9 X$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
0.	0.	0.	0.	0.	0.	
1,000	1,000	.00005	.00005	.....	.....	
2,000	2,000	.00010	.00005	.....	.....	
3,000	3,000	.00015	.00005	.....	.....	
4,000	4,000	.00020	.00005	.....	.....	
5,000	5,000	.00024	.00004	.....	.....	
6,000	6,000	.00030	.00006	.....	.....	
7,000	7,000	.00035	.00005	.....	.....	
8,000	8,000	.00040	.00005	.....	.....	
9,000	9,000	.00045	.00005	.00003	.00003	
10,000	10,000	.00050	.00005	.....	.....	
11,000	11,000	.00056	.00006	.....	.....	
12,000	12,000	.00061	.00005	.....	.....	
13,000	13,000	.00068	.00007	.....	.....	
14,000	14,000	.00073	.00005	.00007	.00004	
15,000	15,000	.00080	.00007	.....	.....	
16,000	16,000	.00085	.00005	.....	.....	
17,000	17,000	.00092	.00007	.....	.....	
18,000	18,000	.00098	.00006	.....	.....	
19,000	19,000	.00104	.00006	.00011	.00004	
20,000	20,000	.00111	.00007	.....	.....	
21,000	21,000	.00116	.00005	.....	.....	
22,000	22,000	.00121	.00005	.....	.....	
23,000	23,000	.00127	.00006	.....	.....	
24,000	24,000	.00135	.00008	.00020	.00009	
25,000	25,000	.00143	.00008	.....	.....	
26,000	26,000	.00152	.00009	.....	.....	
27,000	27,000	.00159	.00007	.....	.....	
28,000	28,000	.00168	.00009	.....	.....	
29,000	29,000	.00177	.00009	.00034	.00014	
30,000	30,000	.00189	.00012	.....	.....	
31,000	31,000	.00199	.00010	.....	.....	
32,000	32,000	.00211	.00012	.....	.....	
33,000	33,000	.00227	.00016	.....	.....	
34,000	34,000	.00240	.00013	.00072	.00038	
35,000	35,000	.00265	.00025	.....	.....	
36,000	36,000	.00280	.00015	.....	.....	
37,000	37,000	.00300	.00020	.....	.....	
38,000	38,000	.00328	.00028	.....	.....	
39,000	39,000	.00360	.00032	.00167	.00095	
40,000	40,000	.....	.....	.....	.....	Ultimate strength.
55,400	55,400	.....	.....	.....	.....	

Failed by triple flexure.

No. 3984.

Marks, 12 M R<sub>12</sub> T R<sub>2</sub>  
B T<sub>1</sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks:
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000155	.000055	.....	.....	
5,000	5,000	.000210	.000055	0.	.....	
6,000	6,000	.000275	.000065	.....	.....	
7,000	7,000	.000330	.000055	.....	.....	
8,000	8,000	.000385	.000055	.....	.....	
9,000	9,000	.000440	.000055	.....	.....	
10,000	10,000	.000500	.000060	.000030	.000030	
11,000	11,000	.000570	.000070	.....	.....	
12,000	12,000	.000630	.000060	.000050	.000020	
13,000	13,000	.000700	.000070	.....	.....	
14,000	14,000	.000780	.000080	.000080	.000030	
15,000	15,000	.000850	.000070	.....	.....	
16,000	16,000	.000945	.000095	.000115	.000035	
17,000	17,000	.001030	.000085	.....	.....	
18,000	18,000	.001130	.000100	.000180	.000065	
19,000	19,000	.001240	.000110	.....	.....	
20,000	20,000	.001370	.000130	.000260	.000080	
21,000	21,000	.001495	.000125	.....	.....	
22,000	22,000	.001580	.000085	.000395	.000135	
23,000	23,000	.001825	.000245	.....	.....	
24,000	24,000	.002040	.000215	.000640	.000245	
25,000	25,000	.002375	.000335	.000880	.000240	
29,560	29,560	.....	.....	.....	.....	Tensile strength.

Fractured 6" from neck.

Appearance, uniform granular.

Specific gravity, 7.2925.

Hardness, 14.73.

No. 3985.

Marks,  $^{12}M R_{13} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000305	.000055	.....	.....	
8,000	8,000	.000360	.000055	.....	.....	
9,000	9,000	.000430	.000070	.....	.....	
10,000	10,000	.000490	.000060	.000035	.000035	
11,000	11,000	.000550	.000060	.....	.....	
12,000	12,000	.000615	.000085	.000050	.000015	
13,000	13,000	.000690	.000075	.....	.....	
14,000	14,000	.000760	.000070	.000085	.000035	
15,000	15,000	.000845	.000085	.....	.....	
16,000	16,000	.000930	.000085	.000110	.000025	
17,000	17,000	.001010	.000080	.....	.....	
18,000	18,000	.001110	.000100	.000180	.000070	
19,000	19,000	.001230	.000120	.....	.....	
20,000	20,000	.001340	.000110	.000255	.000075	
21,000	21,000	.001490	.000150	.....	.....	Tensile strength.
22,000	22,000	.001640	.000150	.000405	.000150	
23,000	23,000	.001850	.000210	.....	.....	
24,000	24,000	.002055	.000205	.000650	.000245	
25,000	25,000	.002350	.000205	.000860	.000210	
27,220	27,220	.....	.....	.....	.....	

Fractured  $5\frac{1}{4}$ " from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $^{12}M R_{13} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength <sup>1</sup>		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3099	B T <sub>3</sub> I	1.129	1.00	31,490	31,490	7.2992	14.98
3100	B T <sub>4</sub> O	1.129	1.00	33,710	33,710	7.2891	15.06
3101	B T <sub>5</sub> M	1.129	1.00	32,980	32,980	7.2983	14.98
3102	B T <sub>6</sub> I	1.129	1.00	33,500	33,500	.....	.....
3103	B T <sub>7</sub> O	1.129	1.00	32,610	32,610	.....	.....
3104	B T <sub>8</sub> M	1.129	1.00	33,430	33,430	7.3017	15.35



No. 833.

Marks,  $^{12}M R_{13} T R_2$   
 $B T_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00031	.00005	.....	.....	
8,000	8,000	.00037	.00006	.....	.....	
9,000	9,000	.00042	.00005	.....	.....	
10,000	10,000	.00048	.00006	.00005	.00005	
11,000	11,000	.00053	.00005	.....	.....	
12,000	12,000	.00058	.00005	.....	.....	
13,000	13,000	.00063	.00005	.....	.....	
14,000	14,000	.00070	.00007	.....	.....	
15,000	15,000	.00077	.00007	.00009	.00004	
16,000	16,000	.00083	.00006	.....	.....	
17,000	17,000	.00089	.00006	.....	.....	
18,000	18,000	.00094	.00005	.....	.....	
19,000	19,000	.00101	.00007	.....	.....	
20,000	20,000	.00108	.00007	.00014	.00005	
21,000	21,000	.00114	.00006	.....	.....	
22,000	22,000	.00120	.00006	.....	.....	
23,000	23,000	.00127	.00007	.....	.....	
24,000	24,000	.00133	.00006	.....	.....	
25,000	25,000	.00141	.00008	.00025	.00011	
26,000	26,000	.00150	.00009	.....	.....	
27,000	27,000	.00159	.00009	.....	.....	
28,000	28,000	.00171	.00012	.....	.....	
29,000	29,000	.00182	.00011	.....	.....	
30,000	30,000	.00192	.00010	.00049	.00024	
31,000	31,000	.00208	.00016	.....	.....	
32,000	32,000	.00222	.00014	.....	.....	
33,000	33,000	.00242	.00020	.....	.....	
34,000	34,000	.00263	.00021	.....	.....	
35,000	35,000	.00287	.00024	.00119	.00070	
36,000	36,000	.00317	.00030	.....	.....	
37,000	37,000	.00345	.00028	.....	.....	
38,000	38,000	.00383	.00028	.....	.....	
39,000	39,000	.00428	.00045	.....	.....	
40,000	40,000	.00490	.00062	.00286	.00167	
52,200	52,200	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 834.

Marks,  $^{12} M R_{13} T R_2$   
 $B R_{10}$ 

Length, 10'.

Diameter, 1' .129.

Sectional area, 1 square inch.

Gauged length, 5'.

Applied loads.		Compression per inch.	Successive compression per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00018	.00006	.....	.....	
5,000	5,000	.00022	.00004	.00002	.00002	
6,000	6,000	.00028	.00006	.....	.....	
7,000	7,000	.00032	.00004	.....	.....	
8,000	8,000	.00038	.00006	.....	.....	
9,000	9,000	.00044	.00006	.....	.....	
10,000	10,000	.00050	.00006	.00006	.00004	
11,000	11,000	.00054	.00004	.....	.....	
12,000	12,000	.00060	.00006	.....	.....	
13,000	13,000	.00068	.00008	.....	.....	
14,000	14,000	.00072	.00004	.....	.....	
15,000	15,000	.00078	.00006	.00010	.00004	
16,000	16,000	.00084	.00006	.....	.....	
17,000	17,000	.00090	.00006	.....	.....	
18,000	18,000	.00096	.00006	.....	.....	
19,000	19,000	.00102	.00006	.....	.....	
20,000	20,000	.00110	.00008	.00018	.00008	
21,000	21,000	.00116	.00006	.....	.....	
22,000	22,000	.00122	.00006	.....	.....	
23,000	23,000	.00126	.00004	.....	.....	
24,000	24,000	.00134	.00008	.....	.....	
25,000	25,000	.00144	.00010	.00024	.00006	
26,000	26,000	.00154	.00010	.....	.....	
27,000	27,000	.00158	.00004	.....	.....	
28,000	28,000	.00168	.00010	.....	.....	
29,000	29,000	.00178	.00010	.....	.....	
30,000	30,000	.00192	.00014	.00050	.00026	
31,000	31,000	.00208	.00016	.....	.....	
32,000	32,000	.00226	.00018	.....	.....	
33,000	33,000	.00244	.00018	.....	.....	
34,000	34,000	.00270	.00026	.....	.....	
35,000	35,000	.00294	.00024	.00120	.00070	
36,000	36,000	.00326	.00032	.....	.....	
37,000	37,000	.00360	.00034	.....	.....	
38,000	38,000	.00390	.00030	.....	.....	
39,000	39,000	.00418	.00028	.....	.....	
40,000	40,000	.00488	.00068	.00286	.00166	
62,600	62,600	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 14.

No. 3990.

Marks,  $^{12}MR_{14}TR_1$   
 $M T_1$ Diameter, 1 $\frac{1}{4}$  .129.

Sectional area, 1 square inch.

Gauged length, 20 $\frac{1}{2}$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000450	.000050	.000005	.000005	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000560	.000060	.000025	.000020	
13,000	13,000	.000635	.000075	.....	.....	
14,000	14,000	.000690	.000065	.000035	.000010	
15,000	15,000	.000750	.000060	.....	.....	
16,000	16,000	.000820	.000070	.000065	.000030	
17,000	17,000	.000885	.000065	.....	.....	
18,000	18,000	.000970	.000085	.000085	.000020	
19,000	19,000	.001050	.000080	.....	.....	
20,000	20,000	.001140	.000090	.000135	.000050	
21,000	21,000	.001210	.000070	.....	.....	
22,000	22,000	.001310	.000100	.000190	.000055	
23,000	23,000	.001435	.000125	.....	.....	
24,000	24,000	.001535	.000100	.000300	.000110	
25,000	25,000	.001700	.000165	.000385	.000085	
31,110	31,110	.....	.....	.....	.....	Tensile strength.

Fractured 2 $\frac{1}{4}$ .75 from neck.

Appearance, uniform granular.

Specific gravity, 7.2942.

Hardness, 17.26.

No. 3991.

Marks,  $12 M R_{14} T R_1$   
 $M T_2$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	.....	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000355	.000055	.....	.....	
9,000	9,000	.000410	.000035	.....	.....	
10,000	10,000	.000465	.000055	.000035	.000035	
11,000	11,000	.000515	.000050	.....	.....	
12,000	12,000	.000585	.000070	.000040	.000005	
13,000	13,000	.0.0645	.000080	.....	.....	
14,000	14,000	.000705	.000060	.000055	.000015	
15,000	15,000	.000760	.000055	.....	.....	
16,000	16,000	.000835	.000075	.000085	.000030	
17,000	17,000	.000910	.000075	.....	.....	
18,000	18,000	.000990	.000080	.000110	.000025	
19,000	19,000	.001060	.000070	.....	.....	
20,000	20,000	.001150	.000090	.000155	.000045	
21,000	21,000	.001245	.000095	.....	.....	
22,000	22,000	.001345	.000100	.000240	.000085	
23,000	23,000	.001455	.000110	.....	.....	
24,000	24,000	.001585	.000130	.000335	.000095	
25,000	25,000	.001735	.000150	.000415	.000080	
30,020	30,020	.....	.....	.....	.....	Tensile strength.

Fractured 3".5 from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{14} T R_1$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per inch.		
		<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3114	$M T_3 I$	1.129	1.00	36,420	36,420	7.3125	18.58
3115	$M T_4 O$	1.129	1.00	34,190	34,190	7.3024	16.73
3116	$M T_5 M$	1.129	1.00	32,400	32,400	7.3169	17.08
3117	$M T_6 O X$	1.129	1.00	33,720	33,720	.....	.....

Appearance of fractures, uniform granular.

No. 836.

Marks,  $^{12} M R_1 T R_1$   
 $M T_2 X$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00035	.00005	.....	.....	
9,000	9,000	.00041	.00006	.....	.....	
10,000	10,000	.00046	.00005	.00003	.00003	
11,000	11,000	.00051	.00005	.....	.....	
12,000	12,000	.00057	.00006	.....	.....	
13,000	13,000	.00062	.00005	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00073	.00005	.00009	.00006	
16,000	16,000	.00079	.00006	.....	.....	
17,000	17,000	.00085	.00006	.....	.....	
18,000	18,000	.00090	.00005	.....	.....	
19,000	19,000	.00095	.00005	.....	.....	
20,000	20,000	.00101	.00006	.00012	.00003	
21,000	21,000	.00108	.00007	.....	.....	
22,000	22,000	.00113	.00005	.....	.....	
23,000	23,000	.00120	.00007	.....	.....	
24,000	24,000	.00126	.00006	.....	.....	
25,000	25,000	.00131	.00005	.00020	.00008	
26,000	26,000	.00139	.00008	.....	.....	
27,000	27,000	.00147	.00008	.....	.....	
28,000	28,000	.00153	.00006	.....	.....	
29,000	29,000	.00159	.00006	.....	.....	
30,000	30,000	.00167	.00008	.00030	.00010	
31,000	31,000	.00175	.00008	.....	.....	
32,000	32,000	.00183	.00008	.....	.....	
33,000	33,000	.00192	.00009	.....	.....	
34,000	34,000	.00204	.00012	.....	.....	
35,000	35,000	.00217	.00013	.00052	.00022	
36,000	36,000	.00230	.00013	.....	.....	
37,000	37,000	.00241	.00011	.....	.....	
38,000	38,000	.00261	.00020	.....	.....	
39,000	39,000	.00281	.00020	.....	.....	
40,000	40,000	.00308	.00027	.00118	.00066	
57,910	57,910	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 3988.

Marks, <sup>12 M R<sub>14</sub> T R<sub>2</sub></sup>  
<sub>B T<sub>1</sub></sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000113	.000050	.....	.....	
4,000	4,000	.000160	.000050	.....	.....	
5,000	5,000	.000210	.000050	.000005	.000005	
6,000	6,000	.000260	.000050	.....	.....	
7,000	7,000	.000320	.000060	.....	.....	
8,000	8,000	.000380	.000060	.....	.....	
9,000	9,000	.000440	.000060	.....	.....	
10,000	10,000	.000500	.000060	.000035	.000030	
11,000	11,000	.000560	.000060	.....	.....	
12,000	12,000	.000630	.000070	.000050	.000015	
13,000	13,000	.000700	.000070	.....	.....	
14,000	14,000	.000765	.000065	.000070	.000020	
15,000	15,000	.000830	.000065	.....	.....	
16,000	16,000	.000920	.000090	.000110	.000040	
17,000	17,000	.001010	.000090	.....	.....	
18,000	18,000	.001105	.000095	.000160	.000050	
19,000	19,000	.001215	.000110	.....	.....	
20,000	20,000	.001340	.000125	.000260	.000100	
21,000	21,000	.001485	.000145	.....	.....	
22,000	22,000	.001635	.000150	.000405	.000145	
23,000	23,000	.001835	.000200	.....	.....	
24,000	24,000	.002050	.000215	.000660	.000255	
25,000	25,000	.002340	.000290	.000865	.000205	
31,410	31,410	.....	.....	.....	.....	Tensile strength.

Fractured 7".5 from neck.

Appearance, uniform granular

Specific gravity, 7.3058.

Hardness, 15.06.

No. 3989.

Marks,  $12 M R_{14} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000255	.000055	.....	.....	
7,000	7,000	.000315	.000060	.....	.....	
8,000	8,000	.000275	.000060	.....	.....	
9,000	9,000	.000430	.000055	.....	.....	
10,000	10,000	.000490	.000060	.000025	.000025	
11,000	11,000	.000550	.000060	.....	.....	
12,000	12,000	.000615	.000065	.000040	.000015	
13,000	13,000	.000685	.000070	.....	.....	
14,000	14,000	.000750	.000065	.000065	.000025	
15,000	15,000	.000835	.000085	.....	.....	
16,000	16,000	.000910	.000075	.000105	.000040	
17,000	17,000	.001000	.000090	.....	.....	
18,000	18,000	.001100	.000100	.000165	.000060	
19,000	19,000	.001230	.000130	.....	.....	
20,000	20,000	.001340	.000110	.000260	.000095	
21,000	21,000	.001485	.000145	.....	.....	Tensile strength.
22,000	22,000	.001685	.000200	.000450	.000190	
23,000	23,000	.001845	.000160	.....	.....	
24,000	24,000	.002105	.000260	.000710	.000260	
25,000	25,000	.002400	.000295	.000930	.000220	
28,100	28,100	.....	.....	.....	.....	

Fractured 6".5 from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{14} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3105	B T <sub>2</sub> I	1.129	1.00	34,310	34,310	.....	.....
3106	B T <sub>2</sub> O	1.129	1.00	33,120	33,120	.....	.....
3107	B T <sub>2</sub> M	1.129	1.00	33,710	33,710	.....	.....
3108	B L <sub>2</sub> I	1.129	1.00	33,200	33,200	7.3147	15.75
3109	B L <sub>2</sub> O	1.129	1.00	33,580	33,580	7.3132	15.20
3113	B L <sub>2</sub> M	1.129	1.00	33,970	33,970	7.3145	15.13

Appearance of fractures, uniform granular.

No. 837.

Marks,  $^{12}M R_2$   $^{14}T R_2$   
 $^{B}T_2$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006			
3,000	3,000	.00011	.00005			
4,000	4,000	.00016	.00005			
5,000	5,000	.00021	.00005	.00001	.00001	
6,000	6,000	.00026	.00005			
7,000	7,000	.00031	.00005			
8,000	8,000	.00037	.00006			
9,000	9,000	.00042	.00005			
10,000	10,000	.00047	.00005	.00005	.00004	
11,000	11,000	.00052	.00005			
12,000	12,000	.00057	.00005			
13,000	13,000	.00062	.00005			
14,000	14,000	.00068	.00006			
15,000	15,000	.00074	.00006	.00009	.00004	
16,000	16,000	.00080	.00006			
17,000	17,000	.00085	.00005			
18,000	18,000	.00091	.00006			
19,000	19,000	.00098	.00007			
20,000	20,000	.00106	.00008	.00012	.00003	
21,000	21,000	.00112	.00006			
22,000	22,000	.00118	.00006			
23,000	23,000	.00123	.00005			
24,000	24,000	.00130	.00007			
25,000	25,000	.00138	.00008	.00021	.00009	
26,000	26,000	.00148	.00010			
27,000	27,000	.00156	.00008			
28,000	28,000	.00166	.00010			
29,000	29,000	.00178	.00012			
30,000	30,000	.00191	.00013	.00050	.00021	
31,000	31,000	.00208	.00017			
32,000	32,000	.00221	.00013			
33,000	33,000	.00241	.00020			
34,000	34,000	.00262	.00021			
35,000	35,000	.00292	.00030	.00130	.00080	
36,000	36,000	.00331	.00039			
37,000	37,000	.00381	.00030			
38,000	38,000	.00395	.00034			
39,000	39,000	.00442	.00047			
40,000	40,000	.00510	.00068	.00311	.00181	
51,650	51,650					Ultimate strength.

Failed by triple flexure.



No. 838.

Marks,  $^{12}M R_{14} T R_2$   
 $B_1 R_{10}$ 

Length, 10''.

Diameter, 1''.129.

Sectional area, 1 square inch.

Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	5,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00028	.00006	.....	.....	
8,000	8,000	.00032	.00004	.....	.....	
9,000	9,000	.00036	.00004	.....	.....	
10,000	10,000	.00042	.00006	0.	.....	
11,000	11,000	.00050	.00008	.....	.....	
12,000	12,000	.00054	.00004	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00066	.00006	.....	.....	
15,000	14,000	.00072	.00006	.00006	.00006	
16,000	16,000	.00076	.00004	.....	.....	
17,000	17,000	.00084	.00008	.....	.....	
18,000	18,000	.00090	.00006	.....	.....	
19,000	19,000	.00096	.00006	.....	.....	
20,000	20,000	.00102	.00006	.00012	.00006	
21,000	21,000	.00106	.00004	.....	.....	
22,000	22,000	.00114	.00008	.....	.....	
23,000	23,000	.00120	.00006	.....	.....	
24,000	24,000	.00130	.00010	.....	.....	
25,000	25,000	.00140	.00010	.00022	.00010	
26,000	26,000	.00148	.00008	.....	.....	
27,000	27,000	.00158	.00010	.....	.....	
28,000	28,000	.00168	.00010	.....	.....	
29,000	29,000	.00180	.00012	.....	.....	
30,000	30,000	.00194	.00014	.00050	.00028	
31,000	31,000	.00212	.00018	.....	.....	
32,000	32,000	.00226	.00014	.....	.....	
33,000	33,000	.00254	.00028	.....	.....	
34,000	34,000	.00276	.00022	.....	.....	
35,000	35,000	.00310	.00034	.00140	.00090	
36,000	36,000	.00340	.00030	.....	.....	
37,000	37,000	.00380	.00040	.....	.....	
38,000	38,000	.00416	.00036	.....	.....	
39,000	39,000	.00478	.00062	.....	.....	
40,000	40,000	.00520	.00042	.....	.....	
60,800	60,800	.....	.....	.00320	.00180	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 16.

No. 4034.

Marks,  $^{12} M R_{16} T R_1$   
 $M T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000300	.000050	-----	-----	
8,000	8,000	.000350	.000050	-----	-----	
9,000	9,000	.000400	.000050	-----	-----	
10,000	10,000	.000445	.000045	0.	-----	
11,000	11,000	.000490	.000045	-----	-----	
12,000	12,000	.000545	.000055	0.	-----	
13,000	13,000	.000605	.000060	-----	-----	
14,000	14,000	.000670	.000065	.000015	.000015	
15,000	15,000	.000745	.000075	-----	-----	
16,000	16,000	.000815	.000070	.000045	.000030	
17,000	17,000	.000875	.000060	-----	-----	
18,000	18,000	.000960	.000085	.000090	.000045	
19,000	19,000	.001045	.000085	-----	-----	
20,000	20,000	.001145	.000100	.000145	.000055	
21,000	21,000	.001245	.000100	-----	-----	
22,000	22,000	.001345	.000100	.000220	.000075	
23,000	23,000	.001470	.000125	-----	-----	
24,000	24,000	.001620	.000150	.000345	.000125	
25,000	25,000	.001790	.000170	.000450	.000105	
29,310	29,310	-----	-----	-----	-----	Tensile strength.

Fractured 2" from neck.

Appearance, granular with dark spots.

Specific gravity, 7.3149.

Hardness, 15.75.

No. 4035.

Marks,  $^{12} M R_{16} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	-----	-----	
3,000	3,000	.000085	.000040	-----	-----	
4,000	4,000	.000140	.000055	-----	-----	
5,000	5,000	.000180	.000040	0.	-----	
6,000	6,000	.000220	.000040	-----	-----	
7,000	7,000	.000285	.000045	-----	-----	
8,000	8,000	.000315	.000050	-----	-----	
9,000	9,000	.000365	.000050	-----	-----	
10,000	10,000	.000415	.000050	0.	-----	
11,000	11,000	.000460	.000045	-----	-----	
12,000	12,000	.000505	.000045	.000005	.000005	
13,000	13,000	.000550	.000045	-----	-----	
14,000	14,000	.000600	.000050	.000025	.000020	
15,000	15,000	.000670	.000070	-----	-----	
16,000	16,000	.000740	.000070	.000040	.000015	
17,000	17,000	.000800	.000060	-----	-----	
18,000	18,000	.000885	.000085	.000080	.000040	
19,000	19,000	.000950	.000065	-----	-----	
20,000	20,000	.001040	.000090	.000130	.000050	
21,000	21,000	.001135	.000095	-----	-----	
22,000	22,000	.001235	.000100	.000190	.000060	Tensile strength.
23,000	23,000	.001335	.000100	-----	-----	
24,000	24,000	.001450	.000115	.000290	.000100	
25,000	25,000	.001595	.000145	.000370	.000080	
28,800	28,800	-----	-----	-----	-----	

Fractured 2".75 from neck.

Appearance, granular with dark spots.

## TENACITY SPECIMENS.

General marks,  $^{12} M R_{16} T R_1$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
3132	M T <sub>2</sub> I	Inches. 1.129	Sq. inch. 1.00	Pounds. 35,680	Pounds. 35,680	7.3397	17.99
3133	M T <sub>2</sub> O	1.129	1.00	31,170	31,170	7.3378	15.91
3134	M T <sub>2</sub> M	1.129	1.00	36,220	36,220	7.3699	17.62
3135	M T <sub>2</sub> O X	1.129	1.00	33,490	33,490	-----	-----

Appearance of fractures, uniform granular.

No. 844.

Marks,  $^{12}M R_{16} T R_1$   
 $M T_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds:</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00009	.00005	.....	.....	
4,000	4,000	.00012	.00003	.....	.....	
5,000	5,000	.00017	.00005	0.	.....	
6,000	6,000	.00020	.00003	.....	.....	
7,000	7,000	.00025	.00005	.....	.....	
8,000	8,000	.00030	.00005	.....	.....	
9,000	9,000	.00038	.00006	.....	.....	
10,000	10,000	.00041	.00005	0.	.....	
11,000	11,000	.00046	.00005	.....	.....	
12,000	12,000	.00051	.00005	.....	.....	
13,000	13,000	.00056	.00005	.....	.....	
14,000	14,000	.00061	.00005	.....	.....	
15,000	15,000	.00067	.00006	.00006	.00006	
16,000	16,000	.00074	.00007	.....	.....	
17,000	17,000	.00080	.00006	.....	.....	
18,000	18,000	.00085	.00005	.....	.....	
19,000	19,000	.00090	.00005	.....	.....	
20,000	20,000	.00097	.00007	.00010	.00004	
21,000	21,000	.00102	.00005	.....	.....	
22,000	22,000	.00109	.00007	.....	.....	
23,000	23,000	.00115	.00006	.....	.....	
24,000	24,000	.00120	.00005	.....	.....	
25,000	25,000	.00127	.00007	.00017	.00007	
26,000	26,000	.00133	.00006	.....	.....	
27,000	27,000	.00140	.00007	.....	.....	
28,000	28,000	.00148	.00008	.....	.....	
29,000	29,000	.00156	.00008	.....	.....	
30,000	30,000	.00168	.00010	.00030	.00013	
31,000	31,000	.00176	.00010	.....	.....	
32,000	32,000	.00185	.00009	.....	.....	
33,000	33,000	.00196	.00011	.....	.....	
34,000	34,000	.00210	.00014	.....	.....	
35,000	35,000	.00222	.00012	.00061	.00031	
36,000	36,000	.00240	.00018	.....	.....	
37,000	37,000	.00260	.00020	.....	.....	
38,000	38,000	.00280	.00020	.....	.....	
39,000	39,000	.00304	.00024	.....	.....	
40,000	40,000	.00342	.00038	.00152	.00091	
55,620	55,620	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4049.

Marks,  $12 M R_{16} T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000255	.000055	-----	-----	
7,000	7,000	.000320	.000065	-----	-----	
8,000	8,000	.000380	.000060	-----	-----	
9,000	9,000	.000430	.000050	-----	-----	
10,000	10,000	.000480	.000050	.000030	.000030	
11,000	11,000	.000550	.000070	-----	-----	
12,000	12,000	.000605	.000055	.000045	.000015	
13,000	13,000	.000675	.000070	-----	-----	
14,000	14,000	.000750	.000075	.000075	.000030	
15,000	15,000	.000825	.000075	-----	-----	
16,000	16,000	.000900	.000075	.000105	.000030	
17,000	17,000	.000980	.000080	-----	-----	
18,000	18,000	.001070	.000090	.000165	.000060	
19,000	19,000	.001175	.000105	-----	-----	
20,000	20,000	.001290	.000115	.000255	.000090	
21,000	21,000	.001390	.000100	-----	-----	Tensile strength.
22,000	22,000	.001560	.000170	.000385	.000130	
23,000	23,000	.001730	.000170	-----	-----	
24,000	24,000	.001900	.000170	.000630	.000245	
24,900	24,900	-----	-----	-----	-----	

Fractured at middle of stem. Appearance, coarse granular with stellar spots on one side, finer granular at the other.

Specific gravity, 7.3209.

Hardness, 14.69.

H. Ex. 165—17

No. 4050.

Marks,  $12 M R_{16} T R_2$   
B.  $T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040	.....	.....	
3,000	3,000	.000090	.000050	.....	.....	
4,000	4,000	.000140	.000050	.....	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000240	.000050	.....	.....	
7,000	7,000	.000295	.000055	.....	.....	
8,000	8,000	.000350	.000055	.....	.....	
9,000	9,000	.000405	.000055	.....	.....	
10,000	10,000	.000460	.000055	.000010	.000010	
11,000	11,000	.000515	.000055	.....	.....	
12,000	12,000	.000585	.000070	.000035	.000025	
13,000	13,000	.000645	.000080	.....	.....	
14,000	14,000	.000710	.000085	.000050	.000015	
15,000	15,000	.000790	.000080	.....	.....	
16,000	16,000	.000865	.000075	.000090	.000040	
17,000	17,000	.000950	.000085	.....	.....	
18,000	18,000	.001050	.000100	.000150	.000080	
19,000	19,000	.001150	.000100	.....	.....	
20,000	20,000	.001260	.000110	.000240	.000090	
21,000	21,000	.001400	.000110	.....	.....	
22,000	22,000	.001525	.000125	.000370	.000130	
23,000	23,000	.001685	.000160	.....	.....	
24,000	24,000	.001875	.000190	.000600	.000230	
25,000	25,000	.002100	.000225	.000760	.000160	
30,210	30,210	.....	.....	.....	.....	Tensile strength.

Fractured  $10\frac{1}{4}$ " from neck. Appearance, medium coarse granular with coarser belt across one side of surface.

## TENACITY SPECIMENS.

General marks,  $12 M R_{16} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3126	B $T_3$ I	1.129	1.00	32,990	32,990	7.3140	14.12
3127	B $T_4$ O	1.129	1.00	34,020	34,020	7.3141	14.12
3128	B $T_5$ M	1.129	1.00	31,510	31,510	7.3314	15.06
3129	B $L_6$ I	1.129	1.00	34,070	34,070	7.3398	14.69
3130	B $L_7$ O	1.129	1.00	34,730	34,730	7.3294	14.98
3131	B $L_8$ M	1.129	1.00	37,640	37,640	7.3532	15.20

## No. 842.

Marks,  $12 M R_{16} T R_2$   
 $B T_3$ 

Length, 12".

Diameter,  $1\frac{1}{4}$  129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005			
3,000	3,000	.00010	.00005			
4,000	4,000	.00015	.00005			
5,000	5,000	.00020	.00005	.00001	.00001	
6,000	6,000	.00024	.00004			
7,000	7,000	.00029	.00005			
8,000	8,000	.00034	.00005			
9,000	9,000	.00040	.00006			
10,000	10,000	.00045	.00005	.00002	.00001	
11,000	11,000	.00051	.00006			
12,000	12,000	.00056	.00005			
13,000	13,000	.00061	.00005			
14,000	14,000	.00066	.00005			
15,000	15,000	.00071	.00005	.00006	.00004	
16,000	16,000	.00077	.00006			
17,000	17,000	.00082	.00005			
18,000	18,000	.00088	.00006			
19,000	19,000	.00095	.00007			
20,000	20,000	.00101	.00006	.00011	.00005	
21,000	21,000	.00108	.00007			
22,000	22,000	.00113	.00005			
23,000	23,000	.00120	.00007			
24,000	24,000	.00128	.00008			
25,000	25,000	.00137	.00009	.00022	.00011	
26,000	26,000	.00148	.00011			
27,000	27,000	.00158	.00010			
28,000	28,000	.00168	.00010			
29,000	29,000	.00179	.00011			
30,000	30,000	.00192	.00013	.00054	.00032	
31,000	31,000	.00212	.00020			
32,000	32,000	.00228	.00016			
33,000	33,000	.00248	.00020			
34,000	34,000	.00275	.00027			
35,000	35,000	.00310	.00035	.00143	.00089	
36,000	36,000	.00354	.00044			
37,000	37,000	.00390	.00036			
38,000	38,000	.00423	.00033			
39,000	39,000	.00468	.00045			
40,000	40,000	.00520	.00052	.00322	.00179	
52,080	52,080					Ultimate strength.

Failed by triple flexure.

No. 843.

Marks,  $^{12} M R_{16} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1" .129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	0.	.....	
11,000	11,000	.00048	.00004	.....	.....	
12,000	12,000	.00052	.00004	.....	.....	
13,000	13,000	.00058	.00006	.....	.....	
14,000	14,000	.00064	.00006	.....	.....	
15,000	15,000	.00068	.00004	.....	.....	
16,000	16,000	.00074	.00006	.00004	.00004	
17,000	17,000	.00080	.00006	.....	.....	
18,000	18,000	.00084	.00004	.....	.....	
19,000	19,000	.00090	.00006	.....	.....	
20,000	20,000	.00096	.00006	.00010	.00006	
21,000	21,000	.00100	.00004	.....	.....	
22,000	22,000	.00108	.00008	.....	.....	
23,000	23,000	.00114	.00006	.....	.....	
24,000	24,000	.00120	.00006	.....	.....	
25,000	25,000	.00128	.00008	.00024	.00014	
26,000	26,000	.00140	.00012	.....	.....	
27,000	27,000	.00150	.00010	.....	.....	
28,000	28,000	.00160	.00010	.....	.....	
29,000	29,000	.00172	.00012	.....	.....	
30,000	30,000	.00184	.00012	.00050	.00026	
31,000	31,000	.00208	.00024	.....	.....	
32,000	32,000	.00224	.00016	.....	.....	
33,000	33,000	.00246	.00022	.....	.....	
34,000	34,000	.00270	.00024	.....	.....	
35,000	35,000	.00308	.00038	.00144	.00094	
36,000	36,000	.00344	.00036	.....	.....	
37,000	37,000	.00378	.00034	.....	.....	
38,000	38,000	.00430	.00052	.....	.....	
39,000	39,000	.00476	.00046	.....	.....	
40,000	40,000	.00528	.00052	.00370	.00226	
63,250	63,250	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.



## CAST-IRON BODY, No. 17.

No. 4038.

Marks,  $^{12}M R_{17} T R_1$   
 $M T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000095	.000045	.....	.....	
4,000	4,000	.000145	.000050	.....	.....	
5,000	5,000	.000195	.000050	0.	.....	
6,000	6,000	.000245	.000050	.....	.....	
7,000	7,000	.000295	.000050	.....	.....	
8,000	8,000	.000345	.000050	.....	.....	
9,000	9,000	.000395	.000050	.....	.....	
10,000	10,000	.000445	.000050	.000030	.000030	
11,000	11,000	.000505	.000060	.....	.....	
12,000	12,000	.000555	.000050	.000040	.000010	
13,000	13,000	.000620	.000065	.....	.....	
14,000	14,000	.000680	.000060	.000060	.000020	
15,000	15,000	.000750	.000070	.....	.....	
16,000	16,000	.000815	.000065	.000095	.000035	
17,000	17,000	.000890	.000075	.....	.....	
18,000	18,000	.000975	.000085	.000140	.000045	
19,000	19,000	.001060	.000085	.....	.....	
20,000	20,000	.001155	.000095	.000205	.000065	
21,000	21,000	.001280	.000125	.....	.....	
22,000	22,000	.001395	.000115	.000310	.000105	
23,000	23,000	.001540	.000145	.....	.....	
24,000	24,000	.001705	.000165	.000490	.000180	
25,000	25,000	.001920	.000215	.000640	.000150	
29,410	29,410	.....	.....	.....	.....	Tensile strength.

Fractured  $7\frac{1}{2}$ " from neck.

Appearance, granular with dark spots.

Specific gravity, 7.3022.

Hardness, 14.47.

No. 4039.

Marks,  $12 M R_{17} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000045	.000045			
3,000	3,000	.000100	.000055			
4,000	4,000	.000145	.000045			
5,000	5,000	.000190	.000045	0.		
6,000	6,000	.000240	.000050			
7,000	7,000	.000290	.000050			
8,000	8,000	.000340	.000050			
9,000	9,000	.000395	.000055			
10,000	10,000	.000450	.000055	.000025	.000025	
11,000	11,000	.000505	.000055			
12,000	12,000	.000560	.000055	.000040	.000015	
13,000	13,000	.000620	.000080			
14,000	14,000	.000685	.000065	.000055	.000015	
15,000	15,000	.000750	.000065			
16,000	16,000	.000825	.000075	.000090	.000035	
17,000	17,000	.000890	.000065			
18,000	18,000	.000965	.000075	.000130	.000040	
19,000	19,000	.001060	.000095			
20,000	20,000	.001150	.000090	.000195	.000065	
21,000	21,000	.001265	.000115			
22,000	22,000	.001385	.000120	.000290	.000095	
23,000	23,000	.001520	.000135			
24,000	24,000	.001665	.000145	.000150	.000160	
25,000	25,000	.001840	.000175	.000555	.000100	
28,270	28,270					Tensile strength.

Fractured  $2\frac{1}{4}$ " from neck.

Appearance, granular with dark spots.

## TENACITY SPECIMENS.

General marks,  $12 M R_{17} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4397	$M T_3 I$	1.129	1.00	35,310	35,310	7.3430	15.83
4398	$M T_4 O$	1.129	1.00	34,300	34,300	7.3358	14.98
4399	$M T_5 M$	1.129	1.00	33,960	33,960	7.3292	14.90
4400	$M T_8 OX$	1.129	1.00	34,510	34,510		

No. 847.

Marks,  $12 \frac{M R_1 T R_1}{M T_2 X}$ 

Length, 12'.

Diameter, 1".129.

Sectional area, 1 per square inch.

Gauged length, 10'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00009	.00006	.....	.....	
4,000	4,000	.00014	.00005	.....	.....	
5,000	5,000	.00019	.00005	0.	.....	
6,000	6,000	.00024	.00005	.....	.....	
7,000	7,000	.00029	.00005	.....	.....	
8,000	8,000	.00034	.00005	.....	.....	
9,000	9,000	.00039	.00005	.....	.....	
10,000	10,000	.00044	.00005	.00001	.00001	
11,000	11,000	.00049	.00005	.....	.....	
12,000	12,000	.00054	.00005	.....	.....	
13,000	13,000	.00059	.00005	.....	.....	
14,000	14,000	.00064	.00005	.....	.....	
15,000	15,000	.00070	.00006	.00008	.00007	
16,000	16,000	.00077	.00007	.....	.....	
17,000	17,000	.00082	.00005	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00094	.00006	.....	.....	
20,000	20,000	.00100	.00006	.00012	.00004	
21,000	21,000	.00108	.00008	.....	.....	
22,000	22,000	.00113	.00005	.....	.....	
23,000	23,000	.00120	.00007	.....	.....	
24,000	24,000	.00126	.00006	.....	.....	
25,000	25,000	.00133	.00007	.00022	.00010	
26,000	26,000	.00142	.00009	.....	.....	
27,000	27,000	.00150	.00008	.....	.....	
28,000	28,000	.00158	.00008	.....	.....	
29,000	29,000	.00168	.00010	.....	.....	
30,000	30,000	.00180	.00012	.00013	.00021	
31,000	31,000	.00193	.00013	.....	.....	
32,000	32,000	.00209	.00016	.....	.....	
33,000	33,000	.00222	.00013	.....	.....	
34,000	34,000	.00243	.00021	.....	.....	
35,000	35,000	.00267	.00024	.00103	.00060	
36,000	36,000	.00290	.00023	.....	.....	
37,000	37,000	.00322	.00032	.....	.....	
38,000	38,000	.00357	.00035	.....	.....	
39,000	39,000	.00393	.00036	.....	.....	
40,000	40,000	.00437	.00044	.00249	.00146	
51,980	51,980	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4036.

Marks,  ${}^{12}M R_1 T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000305	.000055	-----	-----	
8,000	8,000	.000355	.000050	-----	-----	
9,000	9,000	.000425	.000070	-----	-----	
10,000	10,000	.000485	.000080	.000020	.000020	
11,000	11,000	.000540	.000055	-----	-----	
12,000	12,000	.000610	.000070	.000045	.000025	
13,000	13,000	.000675	.000065	-----	-----	
14,000	14,000	.000740	.000065	.000070	.000025	
15,000	15,000	.000810	.000070	-----	-----	
16,000	16,000	.000905	.000095	.000120	.000050	
17,000	17,000	.000990	.000085	-----	-----	
18,000	18,000	.001090	.000100	.000190	.000070	
19,000	19,000	.001190	.000100	-----	-----	
20,000	20,000	.001325	.000135	.000290	.000100	
21,000	21,000	.001460	.000165	-----	-----	
22,000	22,000	.001640	.000150	.000485	.000195	
23,000	23,000	.001840	.000200	-----	-----	
24,000	24,000	.002065	.000225	.000760	.000275	
25,000	25,000	.002360	.000295	.000990	.000230	
28,210	28,210	-----	-----	-----	-----	Tensile strength.

Fractured  $4\frac{1}{4}$ " from neck.

Appearance, fine granular, with coarser granulation near circumference at one side.

Specific gravity, 7.3109.

Hardness, 13.46.

No. 4037.

Marks,  $^{12}M R_{17} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	0.	.....	
6,000	6,000	.000260	.000050	.....	.....	
7,000	7,000	.000330	.000070	.....	.....	
8,000	8,000	.000390	.000060	.....	.....	
9,000	9,000	.000445	.000055	.....	.....	
10,000	10,000	.000505	.000060	.000040	.000040	
11,000	11,000	.000570	.000065	.....	.....	
12,000	12,000	.000640	.000070	.000060	.000020	
13,000	13,000	.000715	.000075	.....	.....	
14,000	14,000	.000800	.000085	.000095	.000035	
15,000	15,000	.000885	.000085	.....	.....	
16,000	16,000	.000990	.000105	.000150	.000055	
17,000	17,000	.001080	.000090	.....	.....	
18,000	18,000	.001190	.000110	.000240	.000090	
19,000	19,000	.001235	.000145	.....	.....	
20,000	20,000	.001465	.000130	.000390	.000150	
21,000	21,000	.001675	.000210	.....	.....	
22,000	22,000	.001865	.000190	.000630	.000240	
23,000	23,000	.002065	.000200	.....	.....	
24,000	24,000	.002405	.000340	.001015	.000385	
25,000	25,000	.002740	.000335	.001260	.000245	
29,530	29,530	.....	.....	.....	.....	Tensile strength.

Fractured 8" from the neck.

Appearance, granular, varying in size.

## TENACITY SPECIMENS.

General marks,  $^{12}M R_{17} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4391	B T <sub>2</sub> I	1.129	1.00	36,200	36,200	.....	.....
4392	B T <sub>2</sub> O	1.129	1.00	36,020	36,020	.....	.....
4393	B T <sub>2</sub> M	1.129	1.00	34,310	34,310	.....	.....
4394	B L <sub>2</sub> I	1.129	1.00	31,990	31,990	7.3225	14.90
4395	B L <sub>2</sub> O	1.129	1.00	33,970	33,970	7.3124	15.13
4396	B L <sub>2</sub> M	1.129	1.00	34,930	34,930	7.2860	13.99

No. 845.

Marks,  $12 MR_{17} TR_2$   
 $B T_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005			
3,000	3,000	.00010	.00005			
4,000	4,000	.00016	.00006			
5,000	5,000	.00021	.00005	.00001	.00001	
6,000	6,000	.00026	.00005			
7,000	7,000	.00031	.00005			
8,000	8,000	.00037	.00006			
9,000	9,000	.00042	.00005			
10,000	10,000	.00048	.00006	.00002	.00001	
11,000	11,000	.00052	.00004			
12,000	12,000	.00058	.00006			
13,000	13,000	.00065	.00007			
14,000	14,000	.00071				
15,000	15,000	.00076	.00005	.00003	.00006	
16,000	16,000	.00082	.00006			
17,000	17,000	.00089	.00007			
18,000	18,000	.00095	.00006			
19,000	19,000	.00101	.00006			
20,000	20,000	.00108	.00007	.00013	.00005	
21,000	21,000	.00115	.00007			
22,000	22,000	.00124	.00009			
23,000	23,000	.00133	.00009			
24,000	24,000	.00142	.00009			
25,000	25,000	.00151	.00009	.00032	.00019	
26,000	26,000	.00163	.00012			
27,000	27,000	.00178	.00013			
28,000	28,000	.00190	.00014			
29,000	29,000	.00210	.00020			
30,000	30,000	.00229	.00019	.00085	.00053	
31,000	31,000	.00255	.00028			
32,000	32,000	.00275	.00020			
33,000	33,000	.00305	.00030			
34,000	34,000	.00345	.00040			
35,000	35,000	.00382	.00037	.00209	.00124	
36,000	36,000	.00432	.00050			
37,000	37,000	.00476	.00044			
38,000	38,000	.00532	.00056			
39,000	39,000	.00588	.00056			
40,000	40,000	.00648	.00060	.00440	.00231	
50,600	50,600					Ultimate strength.

Failed by triple flexure.

No. 846.

Marks, 12 M R<sub>17</sub> T R<sub>2</sub>  
B R<sub>10</sub>

Length, 10'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00010	.....	.....	
4,000	4,000	.00014	.00014	.....	.....	
5,000	5,000	.00020	.00020	0.	.....	
6,000	6,000	.00026	.00026	.....	.....	
7,000	7,000	.00030	.00030	.....	.....	
8,000	8,000	.00034	.00034	.....	.....	
9,000	9,000	.00038	.00038	.....	.....	
10,000	10,000	.00042	.00042	.00002	.00002	
11,000	11,000	.00046	.00046	.00004	.....	
12,000	12,000	.00052	.00052	.....	.....	
13,000	13,000	.00056	.00056	.....	.....	
14,000	14,000	.00062	.00062	.....	.....	
15,000	15,000	.00068	.00068	.00004	.00002	
16,000	16,000	.00074	.00074	.....	.....	
17,000	17,000	.00080	.00080	.....	.....	
18,000	18,000	.00086	.00086	.....	.....	
19,000	19,000	.00094	.00094	.....	.....	
20,000	20,000	.00100	.00100	.00012	.00008	
21,000	21,000	.00106	.00106	.....	.....	
22,000	22,000	.00114	.00114	.....	.....	
23,000	23,000	.00122	.00122	.....	.....	
24,000	24,000	.00132	.00132	.....	.....	
25,000	25,000	.00140	.00140	.00026	.00014	
26,000	26,000	.00154	.00154	.....	.....	
27,000	27,000	.00164	.00164	.....	.....	
28,000	28,000	.00176	.00176	.....	.....	
29,000	29,000	.00194	.00194	.....	.....	
30,000	30,000	.00214	.00214	.00072	.00046	
31,000	31,000	.00246	.00246	.....	.....	
32,000	32,000	.00266	.00266	.....	.....	
33,000	33,000	.00290	.00290	.....	.....	
34,000	34,000	.00328	.00328	.....	.....	
35,000	35,000	.00374	.00374	.00200	.00028	
36,000	36,000	.00416	.00416	.....	.....	
37,000	37,000	.00458	.00458	.....	.....	
38,000	38,000	.00500	.00500	.....	.....	
39,000	39,000	.00550	.00550	.....	.....	
40,000	40,000	.00616	.00616	.....	.....	
60,520	60,520	.....	.....	.00414	.00214	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 18.

No. 4074.

Marks,  $^{12}M R_1 T R_1$   
 $M T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000460	.000060	.000015	.000015	
11,000	11,000	.000530	.000070	.....	.....	
12,000	12,000	.000590	.000060	.000035	.000020	
13,000	13,000	.000645	.000055	.....	.....	
14,000	14,000	.000705	.000060	.000050	.000015	
15,000	15,000	.000785	.000080	.....	.....	
16,000	16,000	.000850	.000065	.000085	.000035	
17,000	17,000	.000935	.000085	.....	.....	
18,000	18,000	.001010	.000075	.000135	.000050	
19,000	19,000	.001100	.000090	.....	.....	
20,000	20,000	.001190	.000090	.000185	.000050	
21,000	21,000	.001290	.000100	.....	.....	
22,000	22,000	.001400	.000110	.000260	.000075	
23,000	23,000	.001540	.000140	.....	.....	
24,000	24,000	.001655	.000115	.000390	.000130	
25,000	25,000	.001825	.000170	.000460	.000070	
29,630	29,630	.....	.....	.....	.....	Tensile strength.

Fractured 3" from the neck.

Appearance, granular mottled.

Specific gravity, 7.2990.

Hardness, 16.15.



No. 4075.

Marks,  $12 M R_{18} T R_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000195	.000045	0.	.....	
6,000	6,000	.000245	.000050	.....	.....	
7,000	7,000	.000295	.000050	.....	.....	
8,000	8,000	.000345	.000050	.....	.....	
9,000	9,000	.000400	.000055	.....	.....	
10,000	10,000	.000460	.000060	.000020	.000020	
11,000	11,000	.000525	.000065	.....	.....	
12,000	12,000	.000580	.000035	.000030	.000010	
13,000	13,000	.000640	.000060	.....	.....	
14,000	14,000	.000700	.000060	.000055	.000025	
15,000	15,000	.000765	.000065	.....	.....	
16,000	16,000	.000840	.000075	.000085	.000030	
17,000	17,000	.000905	.000065	.....	.....	
18,000	18,000	.000990	.000085	.000125	.000040	
19,000	19,000	.001065	.000075	.....	.....	
20,000	20,000	.001150	.000085	.000180	.000055	
21,000	21,000	.001250	.000100	.....	.....	
22,000	22,000	.001350	.000100	.000250	.000070	
23,000	23,000	.001480	.000130	.....	.....	
24,000	24,000	.001630	.000150	.000385	.000135	
25,000	25,000	.001780	.000150	.000480	.000095	
29,870	29,870	.....	.....	.....	.....	Tensile strength.

Fractured 3" from the neck.  
Appearance, granular mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{18} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4407	M T <sub>2</sub> I	1.129	1.00	33,990	33,990	7.2977	17.81
4408	M T <sub>2</sub> O	1.129	1.00	34,420	34,420	7.3183	16.31
4409	M T <sub>2</sub> M	1.129	1.00	32,600	32,600	7.3124	17.26
4410	M T <sub>2</sub> O	1.129	1.00	35,170	35,170	.....	.....

No. 850.

Marks,  $12 M R_{18} T R_1$   
 $M T_9 X$ 

Length, 12''.

Diameter, 1''.129.

Sectional area, 1 square inch.

Gauged length, 10''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00008	.00005	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00017	.00005	0.	.....	
6,000	6,000	.00022	.00005	.....	.....	
7,000	7,000	.00027	.00005	.....	.....	
8,000	8,000	.00031	.00004	.....	.....	
9,000	9,000	.00037	.00006	.....	.....	
10,000	10,000	.00041	.00004	.00002	.00002	
11,000	11,000	.00047	.00006	.....	.....	
12,000	12,000	.00053	.00006	.....	.....	
13,000	13,000	.00058	.00005	.....	.....	
14,000	14,000	.00063	.00005	.....	.....	
15,000	15,000	.00070	.00007	.00008	.00006	
16,000	16,000	.00077	.00007	.....	.....	
17,000	17,000	.00082	.00005	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00093	.00005	.....	.....	
20,000	20,000	.00098	.00005	.00012	.00004	
21,000	21,000	.00106	.00008	.....	.....	
22,000	22,000	.00112	.00006	.....	.....	
23,000	23,000	.00118	.00006	.....	.....	
24,000	24,000	.00126	.00008	.....	.....	
25,000	25,000	.00131	.00005	.00021	.00009	
26,000	26,000	.00140	.00009	.....	.....	
27,000	27,000	.00148	.00008	.....	.....	
28,000	28,000	.00156	.00008	.....	.....	
29,000	29,000	.00163	.00007	.....	.....	
30,000	30,000	.00172	.00009	.00037	.00016	
31,000	31,000	.00183	.00011	.....	.....	
32,000	32,000	.00194	.00011	.....	.....	
33,000	33,000	.00208	.00014	.....	.....	
34,000	34,000	.00221	.00013	.....	.....	
35,000	35,000	.00238	.00017	.00073	.00036	
36,000	36,000	.00259	.00021	.....	.....	
37,000	37,000	.00274	.00015	.....	.....	
38,000	38,000	.00301	.00027	.....	.....	
39,000	39,000	.00328	.00027	.....	.....	
40,000	40,000	.00362	.00034	.00171	.00098	
54,500	54,500	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4072.

Marks,  $^{12}MR_1T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0	0.	0.	0.	
2,000	2,000	.000050	.000050			
3,000	3,000	.000100	.000050			
4,000	4,000	.000150	.000050			
5,000	5,000	.000200	.000050	0.		
6,000	6,000	.000250	.000050			
7,000	7,000	.000300	.000050			
8,000	8,000	.000355	.000055			
9,000	9,000	.000415	.000060			
10,000	10,000	.000480	.000065	.000015	.000015	
11,000	11,000	.000535	.000065			
12,000	12,000	.000600	.000065	.000040	.000025	
13,000	13,000	.000665	.000065			
14,000	14,000	.000740	.000075	.000060	.000020	
15,000	15,000	.000800	.000080			
16,000	16,000	.000885	.000085	.000090	.000030	
17,000	17,000	.000970	.000085			
18,000	18,000	.001060	.000090	.000150	.000060	
19,000	19,000	.001165	.000105			
20,000	20,000	.001275	.000110	.000240	.000090	
21,000	21,000	.001390	.000115			
22,000	22,000	.001540	.000150	.000360	.000120	
23,000	23,000	.001710	.000170			
24,000	24,000	.001885	.000175	.000560	.000200	
25,000	25,000	.002185	.000200	.000740	.000180	
28,010	28,010					Tensile strength.

Fractured 3" from the neck.

Appearance, medium fine granular, with darker and coarser spot at circumference.

Specific gravity, 7.2927.

Hardness, 14.69.

No. 4073.

Marks,  $^{12}M R_{18} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000010	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000255	.000055	-----	-----	
7,000	7,000	.000305	.000060	-----	-----	
8,000	8,000	.000360	.000055	-----	-----	
9,000	9,000	.000420	.000060	-----	-----	
10,000	10,000	.000480	.000060	.000030	.000030	
11,000	11,000	.000545	.000065	-----	-----	
12,000	12,000	.000605	.000060	.000040	.000010	
13,000	13,000	.000670	.000065	-----	-----	
14,000	14,000	.000740	.000070	.000060	.000020	
15,000	15,000	.000810	.000070	-----	-----	
16,000	16,000	.000890	.000080	.000100	.000040	
17,000	17,000	.000970	.000080	-----	-----	
18,000	18,000	.001065	.000095	.000155	.000055	
19,000	19,000	.001165	.000100	-----	-----	
20,000	20,000	.001290	.000125	.000255	.000100	
21,000	21,000	.001420	.000130	-----	-----	
22,000	22,000	.001560	.000140	.000390	.000135	
23,000	23,000	.001740	.000180	-----	-----	
24,000	24,000	.001925	.000185	.000620	.000230	
25,000	25,000	.002160	.000235	.000765	.000145	
27,290	27,290	-----	-----	-----	-----	Tensile strength.

Fractured 11".5 from neck.

Appearance, medium fine granulation, with darker and coarser spot at the circumference.

## TENACITY SPECIMENS.

General marks,  $^{12}M R_{18} T R_2$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4401	$B T_3 I$	1.129	1.00	35,280	35,280	-----	-----
4402	$B T_4 O$	1.129	1.00	35,010	35,010	-----	-----
4403	$B T_5 M$	1.129	1.00	31,440	31,440	-----	-----
4404	$B L_6 I$	1.129	1.00	36,020	36,020	7.2977	15.91
4405	$B L_7 O$	1.129	1.00	37,480	37,480	7.2865	15.20
4406	$B L_8 M$	1.129	1.00	37,350	37,350	7.2945	15.43

No. 848.

Marks,  $^{12} M R_1 T R_2$   
 $B T_9$ 

Length, 12'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00009	.00006	.....	.....	
4,000	4,000	.00013	.00004	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00028	.00006	.....	.....	
8,000	8,000	.00033	.00005	.....	.....	
9,000	9,000	.00038	.00005	.....	.....	
10,000	10,000	.00042	.00004	0.	.....	
11,000	11,000	.00047	.00005	.....	.....	
12,000	12,000	.00053	.00006	.....	.....	
13,000	13,000	.00058	.00005	.....	.....	
14,000	14,000	.00063	.00005	.....	.....	
15,000	15,000	.00069	.00006	.00006	.00006	
16,000	16,000	.00076	.00007	.....	.....	
17,000	17,000	.00082	.00006	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00093	.00005	.....	.....	
20,000	20,000	.00099	.00008	.00010	.00004	
21,000	21,000	.00106	.00007	.....	.....	
22,000	22,000	.00113	.00007	.....	.....	
23,000	23,000	.00120	.00007	.....	.....	
24,000	24,000	.00128	.00008	.....	.....	
25,000	25,000	.00135	.00007	.00021	.00011	
26,000	26,000	.00146	.00011	.....	.....	
27,000	27,000	.00157	.00011	.....	.....	
28,000	28,000	.00164	.00007	.....	.....	
29,000	29,000	.00177	.00013	.....	.....	
30,000	30,000	.00188	.00011	.00050	.00029	
31,000	31,000	.00208	.00020	.....	.....	
32,000	32,000	.00227	.00019	.....	.....	
33,000	33,000	.00247	.00020	.....	.....	
34,000	34,000	.00271	.00024	.....	.....	
35,000	35,000	.00303	.00032	.00138	.00088	
36,000	36,000	.00333	.00030	.....	.....	
37,000	37,000	.00363	.00030	.....	.....	
38,000	38,000	.00408	.00045	.....	.....	
39,000	39,000	.00453	.00045	.....	.....	
40,000	40,000	.00512	.00059	.00313	.00175	
50,480	50,480	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

H. Ex. 165—18

No. 849.

Marks,  $^{12}M R_{18} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compres- sion per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.09006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	.00002	.00002	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00032	.00006	.....	.....	
8,000	8,000	.00036	.00004	.....	.....	
9,000	9,000	.00040	.00004	.....	.....	
10,000	10,000	.00046	.00006	.00004	.00002	
11,000	11,000	.00052	.00006	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00062	.00004	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00074	.00006	.00008	.00004	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00092	.00006	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00104	.00006	.00014	.00006	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00120	.00008	.....	.....	
23,000	23,000	.00126	.00006	.....	.....	
24,000	24,000	.00132	.00006	.....	.....	
25,000	25,000	.00140	.00008	.00028	.00014	
26,000	26,000	.00150	.00010	.....	.....	
27,000	27,000	.00160	.00010	.....	.....	
28,000	28,000	.00170	.00010	.....	.....	
29,000	29,000	.00180	.00010	.....	.....	
30,000	30,000	.00192	.00012	.00052	.00024	
31,000	31,000	.00210	.00018	.....	.....	
32,000	32,000	.00230	.00020	.....	.....	
33,000	33,000	.00252	.00022	.....	.....	
34,000	34,000	.00274	.00022	.....	.....	
35,000	35,000	.00304	.00030	.00136	.00084	
36,000	36,000	.00336	.00032	.....	.....	
37,000	37,000	.00366	.00030	.....	.....	
38,000	38,000	.00404	.00038	.....	.....	
39,000	39,000	.00450	.00046	.....	.....	
40,000	40,000	.00500	.00050	.00306	.00170	
58,250	58,250	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 19.

No. 4047.

Marks, <sup>12 M R<sub>12</sub> T R<sub>1</sub></sup>  
<sub>M T<sub>1</sub></sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000045	.000045	-----	-----	
3,000	3,000	.000095	.000050	-----	-----	
4,000	4,000	.000145	.000050	-----	-----	
5,000	5,000	.000195	.000050	.000005	.000005	
6,000	6,000	.000245	.000050	-----	-----	
7,000	7,000	.000300	.000055	-----	-----	
8,000	8,000	.000350	.000050	-----	-----	
9,000	9,000	.000405	.000055	-----	-----	
10,000	10,000	.000460	.000055	.000030	.000025	
11,000	11,000	.000530	.000070	-----	-----	
12,000	12,000	.000585	.000055	.000045	.000015	
13,000	13,000	.000650	.000065	-----	-----	
14,000	14,000	.000720	.000070	.000070	.000025	
15,000	15,000	.000785	.000065	-----	-----	
16,000	16,000	.000850	.000065	.000095	.000025	
17,000	17,000	.000930	.000080	-----	-----	
18,000	18,000	.001010	.000080	.000130	.000035	
19,000	19,000	.001095	.000085	-----	-----	
20,000	20,000	.001190	.000095	.000195	.000065	
21,000	21,000	.001295	.000105	-----	-----	
22,000	22,000	.001405	.000110	.000280	.000085	
23,000	23,000	.001530	.000125	-----	-----	
24,000	24,000	.001680	.000160	.000425	.000145	
25,000	25,000	.001875	.000195	.000530	.000105	
29,910	29,910	-----	-----	-----	-----	Tensile strength.

Fractured 2 $\frac{1}{4}$ " from neck.

Appearance, medium coarse granular; contains dark spots.

Specific gravity, 7.3160.

Hardness, 15.75.

No. 4048.

Marks,  $12 M R_{19} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000040	.000040	.....	.....	
3,000	3,000	.000095	.000055	.....	.....	
4,000	4,000	.000140	.000045	.....	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000240	.000050	.....	.....	
7,000	7,000	.000295	.000055	.....	.....	
8,000	8,000	.000350	.000055	.....	.....	
9,000	9,000	.000405	.000055	.....	.....	
10,000	10,000	.000460	.000055	.000035	.000035	
11,000	11,000	.000535	.000075	.....	.....	
12,000	12,000	.000590	.000055	.000050	.000015	
13,000	13,000	.000650	.000060	.....	.....	
14,000	14,000	.000725	.000075	.000065	.000015	
15,000	15,000	.000790	.000065	.....	.....	
16,000	16,000	.000855	.000065	.000095	.000030	
17,000	17,000	.000940	.000085	.....	.....	
18,000	18,000	.001015	.000075	.000140	.000045	
19,000	19,000	.001105	.000090	.....	.....	
20,000	20,000	.001200	.000095	.000205	.000065	Tensile strength.
21,000	21,000	.001305	.000105	.....	.....	
22,000	22,000	.001420	.000115	.000300	.000095	
23,000	23,000	.001560	.000140	.....	.....	
24,000	24,000	.001710	.000150	.000455	.000155	
25,000	25,000	.001905	.000195	.000565	.000110	
29,620	29,620	.....	.....	.....	.....	

Fractured 2".25 from neck.

Appearance, medium coarse granular; contains dark spots.

## TENACITY SPECIMENS.

General marks,  $12 M R_{19} T R_1$ .

No of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3122	$M T_3 I$	1.129	1.00	33,390	33,390	7.3219	16.56
3123	$M T_3 O$	1.129	1.00	31,610	31,610	7.3205	15.91
3124	$M T_5 M$	1.129	1.00	31,040	31,040	7.3276	16.56
3125	$M T_8 O X$	1.129	1.00	33,800	33,800	.....	.....



## No. 841.

Marks,  $^{12} M R_{10} T R_1$   
 $M T_9 X$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00010	.....	.....	
4,000	4,000	.00015	.00015	.....	.....	
5,000	5,000	.00020	.00020	0.	.....	
6,000	6,000	.00024	.00024	.....	.....	
7,000	7,000	.00029	.00029	.....	.....	
8,000	8,000	.00034	.00034	.....	.....	
9,000	9,000	.00039	.00039	.....	.....	
10,000	10,000	.00044	.00044	.00001	.00001	
11,000	11,000	.00048	.00048	.....	.....	
12,000	12,000	.00054	.00054	.....	.....	
13,000	13,000	.00059	.00059	.....	.....	
14,000	14,000	.00064	.00064	.....	.....	
15,000	15,000	.00070	.00070	.00006	.00005	
16,000	16,000	.00076	.00076	.....	.....	
17,000	17,000	.00080	.00080	.....	.....	
18,000	18,000	.00086	.00086	.....	.....	
19,000	19,000	.00091	.00091	.....	.....	
20,000	20,000	.00098	.00098	.00010	.00004	
21,000	21,000	.00103	.00103	.....	.....	
22,000	22,000	.00109	.00109	.....	.....	
23,000	23,000	.00115	.00115	.....	.....	
24,000	24,000	.00122	.00122	.....	.....	
25,000	25,000	.00129	.00129	.00016	.00006	
26,000	26,000	.00135	.00135	.....	.....	
27,000	27,000	.00140	.00140	.....	.....	
28,000	28,000	.00149	.00149	.....	.....	
29,000	29,000	.00157	.00157	.....	.....	
30,000	30,000	.00166	.00166	.00029	.00013	
31,000	31,000	.00175	.00175	.....	.....	
32,000	32,000	.00185	.00185	.....	.....	
33,000	33,000	.00196	.00196	.....	.....	
34,000	34,000	.00208	.00208	.....	.....	
35,000	35,000	.00221	.00221	.00060	.00031	
36,000	36,000	.00238	.00238	.....	.....	
37,000	37,000	.00255	.00255	.....	.....	
38,000	38,000	.00273	.00273	.....	.....	
39,000	39,000	.00300	.00300	.....	.....	
40,000	40,000	.00330	.00330	.00141	.00081	
56,380	56,380	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 3992.

Marks,  $^{12}M R_2 T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	-----	-----	
3,000	3,000	.000100	.000045	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	7,000	.000255	.000055	-----	-----	
7,000	7,000	.000310	.000055	-----	-----	
8,000	8,000	.000365	.000055	-----	-----	
9,000	9,000	.000430	.000065	-----	-----	
10,000	10,000	.000500	.000070	.000010	.000010	
11,000	11,000	.000565	.000065	-----	-----	
12,000	12,000	.000640	.000075	.000040	.000030	
13,000	13,000	.000705	.000065	-----	-----	
14,000	14,000	.000795	.000090	.000060	.000020	
15,000	15,000	.000880	.000085	-----	-----	
16,000	16,000	.000965	.000085	.000115	.000055	
17,000	17,000	.001085	.000120	-----	-----	
18,000	18,000	.001185	.000100	.000200	.000085	
19,000	19,000	.001330	.000145	-----	-----	
20,000	20,000	.001470	.000140	.000340	.000140	
21,000	21,000	.001675	.000205	-----	-----	Tensile strength.
22,000	22,000	.001860	.000185	.000585	.000245	
23,000	23,000	.002120	.000260	-----	-----	
24,000	24,000	.002440	.000320	.000990	.000405	
25,000	25,000	.002850	.000410	.001300	.000310	
25,510	25,510	-----	-----	-----	-----	

Fractured 4".25 from neck.

Appearance, granular, one side showing coarser radiant granulation.

Specific gravity, 7.3120.

Hardness, 14.19.

No. 3993.

Marks,  $12 M R_{19} T R_2$   
 $B T_{12}$ 

Length of stem, 23".

Diameter, 1.129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000115	.000060	.....	.....	
4,000	4,000	.000175	.000060	.....	.....	
5,000	5,000	.000230	.000055	.000010	.000010	
6,000	6,000	.000290	.000060	.....	.....	
7,000	7,000	.000340	.000050	.....	.....	
8,000	8,000	.000405	.000065	.....	.....	
9,000	9,000	.000465	.000060	.....	.....	
10,000	10,000	.000540	.000075	.000045	.000035	
11,000	11,000	.000600	.000080	.....	.....	
12,000	12,000	.000675	.000075	.000080	.000015	
13,000	13,000	.000750	.000075	.....	.....	
14,000	14,000	.000835	.000085	.000100	.000040	
15,000	15,000	.000910	.000075	.....	.....	
16,000	16,000	.001010	.000100	.000150	.000050	
17,000	17,000	.001115	.000105	.....	.....	
18,000	18,000	.001240	.000125	.000240	.000090	
19,000	19,000	.001355	.000115	.....	.....	
20,000	20,000	.001500	.000145	.000360	.000120	Tensile strength.
21,000	21,000	.001690	.000190	.....	.....	
22,000	22,000	.001885	.000195	.000600	.000240	
23,000	23,000	.002130	.000245	.....	.....	
24,000	24,000	.002450	.0003.0	.001000	.000400	
25,000	25,000	.002810	.000360	.001260	.000260	
29,610	29,610	.....	.....	.....	.....	

Fractured 4.1" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{19} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
3119	B T <sub>3</sub> I	1.129	1.00	30,090	30,090	.....	.....
3120	B T <sub>4</sub> O	1.129	1.00	33,320	33,320	.....	.....
3121	B T <sub>5</sub> M	1.129	1.00	31,140	31,140	.....	.....
3110	B L <sub>4</sub> I	1.129	1.00	31,410	31,410	7.3215	14.69
3111	B L <sub>7</sub> O	1.129	1.00	32,040	32,040	7.3139	14.69
3112	B L <sub>8</sub> M	1.129	1.00	31,590	31,590	7.3224	15.13

No. 839.

Marks,  $12\text{ MR}_{10}\text{TR}_2$   
 $\text{BT}_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compres- sion per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00007	.00007	.....	.....	
3,000	3,000	.00011	.00004	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00021	.00005	.00001	.00001	
6,000	6,000	.00028	.00007	.....	.....	
7,000	7,000	.00032	.00004	.....	.....	
8,000	8,000	.00038	.00006	.....	.....	
9,000	9,000	.00042	.00004	.....	.....	
10,000	10,000	.00048	.00006	.00005	.00004	
11,000	11,000	.00053	.00005	.....	.....	
12,000	12,000	.00059	.00006	.....	.....	
13,000	13,000	.00067	.00008	.....	.....	
14,000	14,000	.00072	.00005	.....	.....	
15,000	15,000	.00078	.00006	.00009	.00004	
16,000	16,000	.00084	.00006	.....	.....	
17,000	17,000	.00090	.00006	.....	.....	
18,000	18,000	.00098	.00008	.....	.....	
19,000	19,000	.00104	.00006	.....	.....	
20,000	20,000	.00111	.00007	.00016	.00007	
21,000	21,000	.00118	.00007	.....	.....	
22,000	22,000	.00124	.00006	.....	.....	
23,000	23,000	.00133	.00009	.....	.....	
24,000	24,000	.00142	.00009	.....	.....	
25,000	25,000	.00151	.00009	.00030	.00014	
26,000	26,000	.00162	.00011	.....	.....	
27,000	27,000	.00173	.00011	.....	.....	
28,000	28,000	.00186	.00013	.....	.....	
29,000	29,000	.00201	.00015	.....	.....	
30,000	30,000	.00219	.00018	.00072	.00042	
31,000	31,000	.00239	.00020	.....	.....	
32,000	32,000	.00258	.00019	.....	.....	
33,000	33,000	.00281	.00023	.....	.....	
34,000	34,000	.00313	.00032	.....	.....	
35,000	35,000	.00347	.00034	.00173	.00101	
36,000	36,000	.00400	.00053	.....	.....	Ultimate strength.
37,000	37,000	.00426	.00026	.....	.....	
38,000	38,000	.00465	.00039	.....	.....	
39,000	39,000	.00515	.00050	.....	.....	
40,000	40,000	.00565	.00050	.00361	.00188	
51,800	51,800	.....	.....	.....	.....	

Failed by triple flexure.

## No. 840.

Marks,  $^{12} M R_{18} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	-----	-----	
3,000	3,000	.00012	.00006	-----	-----	
4,000	4,000	.00016	.00004	-----	-----	
5,000	5,000	.00020	.00004	0.	-----	
6,000	6,000	.00026	.00006	-----	-----	
7,000	7,000	.00030	.00004	-----	-----	
8,000	8,000	.00036	.00006	-----	-----	
9,000	9,000	.00040	.00004	-----	-----	
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00050	.00004	-----	-----	
12,000	12,000	.00058	.00008	-----	-----	
13,000	13,000	.00066	.00008	-----	-----	
14,000	14,000	.00072	.00006	-----	-----	
15,000	15,000	.00078	.00006	.00014	.00012	
16,000	16,000	.00082	.00004	-----	-----	
17,000	17,000	.00086	.00004	-----	-----	
18,000	18,000	.00092	.00006	-----	-----	
19,000	19,000	.00098	.00006	-----	-----	
20,000	20,000	.00102	.00004	.00020	.00006	
21,000	21,000	.00110	.00008	-----	-----	
22,000	22,000	.00120	.00010	-----	-----	
23,000	23,000	.00128	.00008	-----	-----	
24,000	24,000	.00138	.00010	-----	-----	
25,000	25,000	.00150	.00012	.00038	.00018	
26,000	26,000	.00160	.00010	-----	-----	
27,000	27,000	.00172	.00012	-----	-----	
28,000	28,000	.00182	.00010	-----	-----	
29,000	29,000	.00200	.00018	-----	-----	
30,000	30,000	.00220	.00020	.00072	.00034	
31,000	31,000	.00242	.00022	-----	-----	
32,000	32,000	.00260	.00018	-----	-----	
33,000	33,000	.00290	.00030	-----	-----	
34,000	34,000	.00314	.00024	-----	-----	
35,000	35,000	.00360	.00046	.00186	.00114	
36,000	36,000	.00396	.00036	-----	-----	
37,000	37,000	.00430	.00034	-----	-----	
38,000	38,000	.00470	.00040	-----	-----	
39,000	39,000	.00514	.00044	-----	-----	
40,000	40,000	.00570	.00056	.00380	.00194	
61,900	61,900	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 20.

No. 4078.

Marks,  $12 M R_{20} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055			
3,000	3,000	.000105	.000050			
4,000	4,000	.000155	.000050			
5,000	5,000	.000200	.000045	.000005	.000005	
6,000	6,000	.000255	.000055			
7,000	7,000	.000305	.000050			
8,000	8,000	.000360	.000055			
9,000	9,000	.000410	.000050			
10,000	10,000	.000465	.000055	.000030	.000025	
11,000	11,000	.000530	.000065			
12,000	12,000	.000580	.000050	.000035	.000005	
13,000	13,000	.000650	.000070			
14,000	14,000	.000710	.000060	.000055	.000020	
15,000	15,000	.000770	.000060			
16,000	16,000	.000850	.000080	.000085	.000030	
17,000	17,000	.000920	.000070			
18,000	18,000	.001000	.000080	.000115	.000030	
19,000	19,000	.001085	.000085			
20,000	20,000	.001185	.000100	.000170	.000055	
21,000	21,000	.001270	.000085			
22,000	22,000	.001390	.000120	.000260	.000090	
23,000	23,000	.001500	.000110			
24,000	24,000	.001635	.000135	.000370	.000110	
25,000	25,000	.001790	.000155	.000450	.000080	
29,080	29,080					Tensile strength.

Fractured 2" from neck.

Appearance, granular mottled.

## TENACITY SPECIMENS.

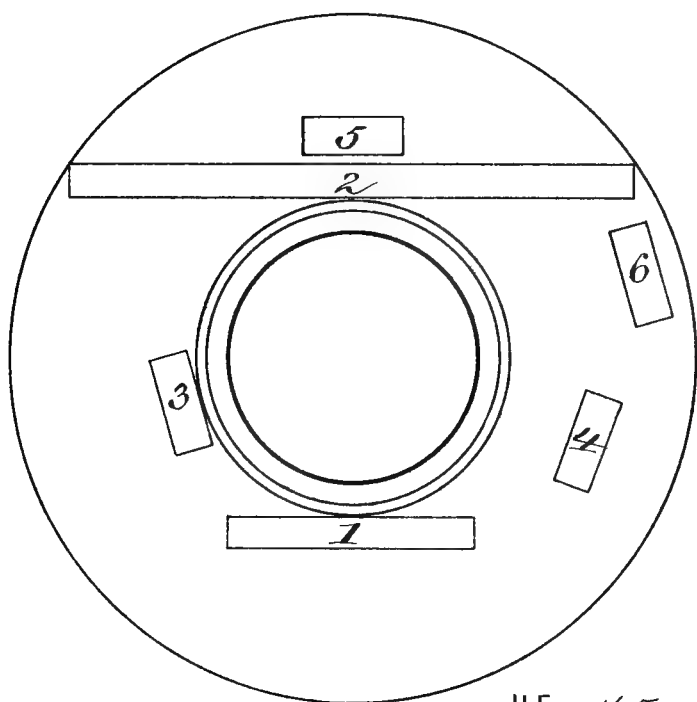
General marks,  $12 M R_{20} T R_1$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4418	$M T_3 I$	1.129	1.00	34,150	34,150	7.3191	17.17
4419	$M T_4 O$	1.129	1.00	31,700	31,700	7.3282	16.07
4420	$M T_5 M$	1.129	1.00	32,450	32,450	7.3324	16.90
4421	$M T_6 O$	1.129	1.00	33,720	33,720	7.3015	15.59

*12-inch B.L. Rifled Mortars.*

*Cast Iron Body No. 20.*

*Specimens from Muzzle disc.*



H Ex. 16.5 51 2





No. 851.

Marks,  $^{12}M R_{20} T R_1$   
 $M T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	-----	-----	
3,000	3,000	.00008	.00005	-----	-----	
4,000	4,000	.00012	.00004	-----	-----	
5,000	5,000	.00016	.00004	0.	-----	
6,000	6,000	.00019	.00003	-----	-----	
7,000	7,000	.00024	.00005	-----	-----	
8,000	8,000	.00029	.00005	-----	-----	
9,000	9,000	.00034	.00005	-----	-----	
10,000	10,000	.00039	.00005	.00001	.00001	
11,000	11,000	.00044	.00005	-----	-----	
12,000	12,000	.00050	.00006	-----	-----	
13,000	13,000	.00055	.00005	-----	-----	
14,000	14,000	.00060	.00005	-----	-----	
15,000	15,000	.00065	.00005	.00005	.00004	
16,000	16,000	.00071	.00006	-----	-----	
17,000	17,000	.00076	.00005	-----	-----	
18,000	18,000	.00081	.00005	-----	-----	
19,000	19,000	.00088	.00007	-----	-----	
20,000	20,000	.00092	.00004	.00009	.00004	
21,000	21,000	.00099	.00007	-----	-----	
22,000	22,000	.00104	.00005	-----	-----	
23,000	23,000	.00111	.00007	-----	-----	
24,000	24,000	.00118	.00007	-----	-----	
25,000	25,000	.00123	.00005	.00014	.00005	
26,000	26,000	.00130	.00007	-----	-----	
27,000	27,000	.00138	.00008	-----	-----	
28,000	28,000	.00144	.00006	-----	-----	
29,000	29,000	.00150	.00006	-----	-----	
30,000	30,000	.00159	.00009	.00024	.00010	
31,000	31,000	.00170	.00011	-----	-----	
32,000	32,000	.00178	.00008	-----	-----	
33,000	33,000	.00188	.00010	-----	-----	
34,000	34,000	.00198	.00010	-----	-----	
35,000	35,000	.00210	.00012	.00048	.00024	
36,000	36,000	.00226	.00016	-----	-----	
37,000	37,000	.00240	.00014	-----	-----	
38,000	38,000	.00257	.00017	-----	-----	
39,000	39,000	.00278	.00021	-----	-----	
40,000	40,000	.00300	.00022	.00110	.00062	
56,650	56,650	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

No. 4076.

Marks,  $^{12}M R_{20} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	-----	-----	
3,000	3,000	.000105	.000050	-----	-----	
4,000	4,000	.000155	.000050	-----	-----	
5,000	5,000	.000205	.000050	0.	-----	
6,000	6,000	.000260	.000055	-----	-----	
7,000	7,000	.000310	.000050	-----	-----	
8,000	8,000	.000370	.000060	-----	-----	
9,000	9,000	.000425	.000055	-----	-----	
10,000	10,000	.000500	.000075	.000025	.000025	
11,000	11,000	.000550	.000050	-----	-----	
12,000	12,000	.000610	.000060	.000040	.000015	
13,000	13,000	.000680	.000070	-----	-----	
14,000	14,000	.000750	.000070	.000070	.000030	
15,000	15,000	.000840	.000090	-----	-----	
16,000	16,000	.000910	.000070	.000115	.000045	
17,000	17,000	.001005	.000095	-----	-----	
18,000	18,000	.001105	.000100	.000170	.000055	
19,000	19,000	.001210	.000105	-----	-----	
20,000	20,000	.001320	.000110	.000265	.000095	
21,000	21,000	.001460	.000140	-----	-----	Tensile strength.
22,000	22,000	.001625	.000165	.000430	.000165	
23,000	23,000	.001820	.000195	-----	-----	
24,000	24,000	.002060	.000240	.000700	.000270	
25,000	25,000	.002310	.000250	.000880	.000180	
30,590	30,590	-----	-----	-----	-----	

Fractured 11" from neck.

Appearance, uniform granular.

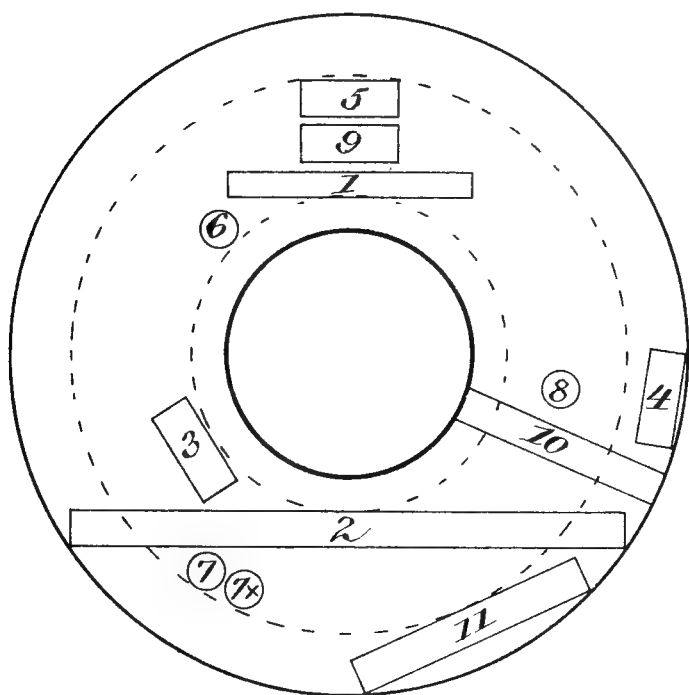
Specific gravity, 7.3163.

Hardness, 14.33.

*12-inch B.L. Rifled Mortars.*

*Cast Iron Body No. 20.*

*Specimens from Breech disc.*



HEx. 16.5 51 2



No. 4077.

Marks,  $12 M R_{20} T R_2$   
B T<sub>11</sub>

Length of stem, 10".

Diameter, 1".128.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00005	.00005			
3,000	3,000	.00010	.00005			
4,000	4,000	.00016	.00006			
5,000	5,000	.00021	.00005			
6,000	6,000	.00027	.00006	0.		
7,000	7,000	.00033	.00006			
8,000	8,000	.00040	.00007			
9,000	9,000	.00048	.00008			
10,000	10,000	.00053	.00005	.00003	.00003	
11,000	11,000	.00058	.00005			
12,000	12,000	.00065	.00007	.00003	.00005	
13,000	13,000	.00072	.00007			
14,000	14,000	.00081	.00009	.00010	.00002	
15,000	15,000	.00088	.00007			
16,000	16,000	.00098	.00010	.00013	.00003	Tensile strength.
17,000	17,000	.00107	.00009			
18,000	18,000	.00118	.00011	.00022	.00009	
19,000	19,000	.00130	.00012			
20,000	20,000	.00142	.00012	.00033	.00011	
21,000	21,000	.00158	.00016			
22,000	22,000	.00178	.00020	.00053	.00020	
23,000	23,000	.00198	.00020			
24,000	24,000	.00228	.00030	.00088	.00035	
25,000	25,000	.00270	.00042	.00120	.00092	
31,410	31,410					

Fractured 3".4 from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{20} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4411	B T <sub>3</sub> I	1.129	1.00	32,510	32,510		
4412	B T <sub>4</sub> O	1.129	1.00	33,690	33,690		
4413	B T <sub>5</sub> M	1.129	1.00	33,610	33,610		
4414	B L <sub>6</sub> I	1.129	1.00	34,990	34,990	7.3191	15.43
4415	B L <sub>7</sub> O	1.129	1.00	33,840	33,840	7.3148	14.98
4416	B L <sub>8</sub> M	1.129	1.00	33,340	33,340	7.3237	15.36
4417	B T <sub>9</sub> M	1.129	1.00	31,970	31,970		

No. 852.

Marks,  $12 M R^{20} T R^3$   
 $B T^1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00035	.00005	.....	.....	
9,000	9,000	.00040	.00005	.....	.....	
10,000	10,000	.00045	.00005	.00001	.00001	
11,000	11,000	.00052	.00007	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00063	.00005	.....	.....	
14,000	14,000	.00070	.00007	.....	.....	
15,000	15,000	.00075	.00005	.00008	.00007	
16,000	16,000	.00082	.00007	.....	.....	
17,000	17,000	.00090	.00008	.....	.....	
18,000	18,000	.00098	.00008	.....	.....	
19,000	19,000	.00104	.00006	.....	.....	
20,000	20,000	.00110	.00006	.00015	.00007	
21,000	21,000	.00119	.00009	.....	.....	
22,000	22,000	.00127	.00003	.....	.....	
23,000	23,000	.00137	.00010	.....	.....	
24,000	24,000	.00143	.00006	.....	.....	
25,000	25,000	.00152	.00009	.00030	.00015	
26,000	26,000	.00164	.00012	.....	.....	
27,000	27,000	.00177	.00013	.....	.....	
28,000	28,000	.00190	.00013	.....	.....	
29,000	29,000	.00205	.00015	.....	.....	
30,000	30,000	.00222	.00017	.00068	.00038	
31,000	31,000	.00245	.00023	.....	.....	
32,000	32,000	.00265	.00020	.....	.....	
33,000	33,000	.00295	.00030	.....	.....	
34,000	34,000	.00325	.00030	.....	.....	
35,000	35,000	.00356	.00031	.00162	.00094	
36,000	36,000	.00405	.00049	.....	.....	
37,000	37,000	.00435	.00030	.....	.....	
38,000	38,000	.00470	.00035	.....	.....	
39,000	39,000	.00535	.00063	.....	.....	
40,000	40,000	.00598	.00063	.00369	.00207	
51,290	51,290	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

Specific gravity, 7.3083.

Hardness, 15.91.

No. 853.

Marks,  $12 M R_{20} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.0002	0.0002	0.	0.	
2,000	2,000	0.0008	0.0006	0.	0.	
3,000	3,000	0.0014	0.0006	0.	0.	
4,000	4,000	0.0020	0.0006	0.	0.	
5,000	5,000	0.0024	0.0004	0.	0.	
6,000	6,000	0.0028	0.0004	0.	0.	
7,000	7,000	0.0032	0.0004	0.	0.	
8,000	8,000	0.0036	0.0006	0.	0.	
9,000	9,000	0.0042	0.0006	0.	0.	
10,000	10,000	0.0048	0.0006	0.	0.	
11,000	11,000	0.0054	0.0006	0.	0.	
12,000	12,000	0.0058	0.0004	0.	0.	
13,000	13,000	0.0062	0.0004	0.	0.	
14,000	14,000	0.0068	0.0006	0.0004	0.0004	
15,000	15,000	0.0076	0.0008	0.0008	0.0008	
16,000	16,000	0.0082	0.0006	0.0006	0.0006	
17,000	17,000	0.0088	0.0006	0.0006	0.0006	
18,000	18,000	0.0094	0.0006	0.0006	0.0006	
19,000	19,000	0.0100	0.0006	0.0010	0.0006	
20,000	20,000	0.0106	0.0006	0.0012	0.0006	
21,000	21,000	0.0112	0.0006	0.0012	0.0006	
22,000	22,000	0.0120	0.0008	0.0012	0.0006	
23,000	23,000	0.0126	0.0006	0.0012	0.0006	
24,000	24,000	0.0136	0.0010	0.0024	0.0014	
25,000	25,000	0.0144	0.0008	0.0024	0.0014	
26,000	26,000	0.0156	0.0012	0.0012	0.0012	
27,000	27,000	0.0168	0.0012	0.0012	0.0012	
28,000	28,000	0.0180	0.0016	0.0020	0.0030	
29,000	29,000	0.0216	0.0020	0.0020	0.0020	
30,000	30,000	0.0236	0.0024	0.0024	0.0024	
31,000	31,000	0.0260	0.0028	0.0038	0.0038	
32,000	32,000	0.0288	0.0038	0.0150	0.0096	
33,000	33,000	0.0326	0.0038	0.0038	0.0038	
34,000	34,000	0.0354	0.0040	0.0040	0.0040	
35,000	35,000	0.0394	0.0040	0.0040	0.0040	
36,000	36,000	0.0434	0.0050	0.0050	0.0050	
37,000	37,000	0.0484	0.0056	0.00340	0.00190	
38,000	38,000	0.0540	0.0056	0.00340	0.00190	
39,000	39,000	0.0540	0.0056	0.00340	0.00190	
40,000	40,000	0.0540	0.0056	0.00340	0.00190	
41,020	41,020	0.0540	0.0056	0.00340	0.00190	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 21.

No. 4084.

Marks,  $12 M R_{21} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000310	.000060	-----	-----	
8,000	8,000	.000360	.000050	-----	-----	
9,000	9,000	.000410	.000050	-----	-----	
10,000	10,000	.000470	.000060	.000005	.000005	
11,000	11,000	.000530	.000060	-----	-----	
12,000	12,000	.000595	.000065	.000010	.000005	
13,000	13,000	.000650	.000055	-----	-----	
14,000	14,000	.000715	.000065	.000035	.000025	
15,000	15,000	.000785	.000070	-----	-----	
16,000	16,000	.000860	.000075	.000060	.000025	
17,000	17,000	.000930	.000070	-----	-----	
18,000	18,000	.001020	.000090	.000105	.000045	
19,000	18,000	.001105	.000085	-----	-----	
20,000	20,000	.001205	.000100	.000165	.000060	
21,000	21,000	.001305	.000100	-----	-----	
22,000	22,000	.001450	.000145	.000260	.000105	
23,000	23,000	.001595	.000145	-----	-----	
24,000	24,000	.001760	.000165	.000440	.000180	
25,000	25,000	.002005	.000245	.000595	.000155	
28,350	28,350	-----	-----	-----	-----	Tensile strength.

Fractured 9".5 from neck.

Appearance, uniform granular:

## TENACITY SPECIMENS.

General marks,  $12 M R_{21} T R_1$ .

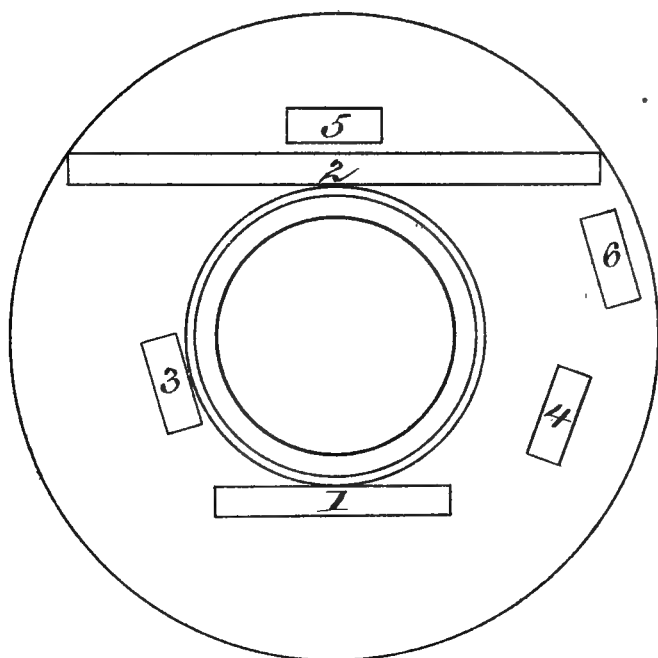
No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4429	$M T_3 I$	1.129	1.00	33,610	33,610	7.3105	15.91
4430	$M T_4 O$	1.129	1.00	31,520	31,520	7.3122	15.43
4431	$M T_5 M$	1.129	1.00	31,700	31,700	7.3278	16.48
4432	$M T_6 O$	1.129	1.00	34,800	34,800	7.3158	15.99



*12-inch B.L. Rifled Mortars.*

*Cast Iron Bodies Nos. 21, 22, 23  
24, 25, 26, 27, 28, 29, 30, 31.*

*Specimens from Muzzle discs.*



H Ex. 165 51 2



## No. 856.

Marks,  $12 M R_2 T R_1$   
 $M T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00011	.00006	.....	.....	
4,000	4,000	.00015	.00004	.....	.....	
5,000	5,000	.00020	.00005	.00001	.00001	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00031	.00006	.....	.....	
8,000	8,000	.00036	.00005	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00047	.00006	.00002	.00002	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00057	.00005	.....	.....	
13,000	13,000	.00063	.00006	.....	.....	
14,000	14,000	.00068	.00005	.....	.....	
15,000	15,000	.00072	.00004	.00007	.00002	
16,000	16,000	.00079	.00007	.....	.....	
17,000	17,000	.00085	.00006	.....	.....	
18,000	18,000	.00091	.00006	.....	.....	
19,000	19,000	.00097	.00006	.....	.....	
20,000	20,000	.00102	.00005	.00010	.00003	
21,000	21,000	.00108	.00006	.....	.....	
22,000	22,000	.00113	.00005	.....	.....	
23,000	23,000	.00121	.00008	.....	.....	
24,000	24,000	.00128	.00007	.....	.....	
25,000	25,000	.00134	.00006	.00018	.00008	
26,000	26,000	.00142	.00008	.....	.....	
27,000	27,000	.00150	.00008	.....	.....	
28,000	28,000	.00160	.00010	.....	.....	
29,000	29,000	.00168	.00008	.....	.....	
30,000	30,000	.00177	.00009	.00032	.00014	
31,000	31,000	.00188	.00011	.....	.....	
32,000	32,000	.00198	.00010	.....	.....	
33,000	33,000	.00208	.00010	.....	.....	
34,000	34,000	.00221	.00013	.....	.....	
35,000	35,000	.00237	.00016	.00067	.00035	
36,000	36,000	.00257	.00020	.....	.....	
37,000	37,000	.00271	.00014	.....	.....	
38,000	38,000	.00294	.00023	.....	.....	
39,000	39,000	.00318	.00024	.....	.....	
40,000	40,000	.00352	.00034	.00148	.00081	
55,900	55,900	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

Specific gravity, 7.3195.

Hardness, 17.81.

H. Ex. 165—19

No. 4085.

Marks,  $^{12}M R_{21} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	-----	-----	
3,000	3,000	.000110	.000055	-----	-----	
4,000	4,000	.000160	.000050	-----	-----	
5,000	5,000	.000215	.000055	.000005	.000005	
6,000	6,000	.000275	.000060	-----	-----	
7,000	7,000	.000340	.000065	-----	-----	
8,000	8,000	.000400	.000060	-----	-----	
9,000	9,000	.000460	.000060	-----	-----	
10,000	10,000	.000515	.000055	.000040	.000035	
11,000	11,000	.000590	.000075	-----	-----	
12,000	12,000	.000660	.000070	.000155	.000015	
13,000	13,000	.000745	.000085	-----	-----	
14,000	14,000	.000820	.000075	.000090	.000035	
15,000	15,000	.000910	.000090	-----	-----	
16,000	16,000	.001010	.000100	.000155	.000065	
17,000	17,000	.001110	.000100	-----	-----	
18,000	18,000	.001250	.000140	.000250	.000095	
19,000	19,000	.001385	.000135	-----	-----	
20,000	20,000	.001555	.000170	.000405	.000155	
21,000	21,000	.001745	.000190	-----	-----	
22,000	22,000	.001985	.000240	.000660	.000255	
23,000	23,000	.002275	.000290	-----	-----	
24,000	24,000	.002625	.000350	.001140	.000480	
25,000	25,000	.003105	.000480	.001515	.000375	
29,630	29,630	-----	-----	-----	-----	Tensile strength.

Fractured  $1\frac{1}{4}$ " from neck.

Appearance, uniform granular.

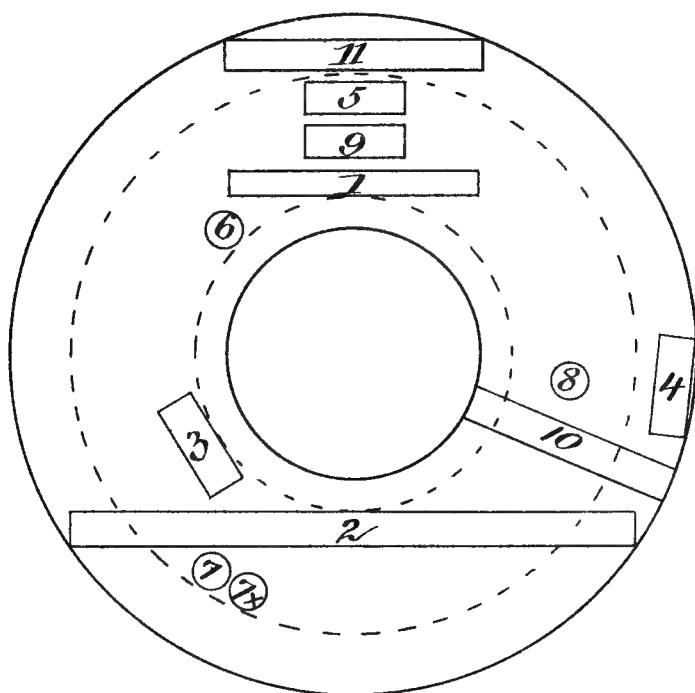
Specific gravity, 7.3128.

Hardness, 14.33.

*12-inch B. L. Rifled Mortars.*

*Cast Iron Bodies Nos. 21, 23, 25.*

*Specimens from Breech discs.*



H Ex. 165 51 2



No. 4086.

Marks,  $12 M R_{21} T R_2$   
B T<sub>11</sub>

Length of stem, about 9".4.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000040	.000040	-----	-----	
3,000	3,000	.000100	.000060	-----	-----	
4,000	4,000	.000160	.000060	-----	-----	
5,000	5,000	.000220	.000060	0.	-----	
6,000	6,000	.000280	.000060	-----	-----	
7,000	7,000	.000320	.000040	-----	-----	
8,000	8,000	.000380	.000060	-----	-----	
9,000	9,000	.000440	.000060	-----	-----	
10,000	10,000	.000500	.000060	.000020	.000020	
11,000	11,000	.000580	.000080	-----	-----	
12,000	12,000	.000660	.000080	.000060	.000040	
13,000	13,000	.000740	.000080	-----	-----	
14,000	14,000	.000820	.000080	.000100	.000040	
15,000	15,000	.000900	.000080	-----	-----	
16,000	16,000	.001000	.000100	.000160	.000060	
17,000	17,000	.001120	.000120	-----	-----	Tensile strength.
18,000	18,000	.001240	.000120	.000260	.000100	
19,000	19,000	.001360	.000120	-----	-----	
20,000	20,000	.001540	.000180	.000380	.000120	
21,000	21,000	.001740	.000200	-----	-----	
22,000	22,000	.001980	.000240	.000660	.000280	
23,000	23,000	.002260	.000280	-----	-----	
24,000	24,000	.002600	.000340	.001120	.000460	
25,000	25,000	.003020	.000420	.001440	.000320	
31,280	31,280	-----	-----	-----	-----	

Fractured 4" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{21} T R_2$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4422	B T <sub>2</sub> I	1.129	1.00	30,970	30,970	-----	-----
4423	B T <sub>4</sub> O	1.129	1.00	33,530	33,530	-----	-----
4424	B T <sub>5</sub> M	1.129	1.00	30,410	30,410	-----	-----
4425	B L <sub>2</sub> I	1.129	1.00	31,170	31,170	7.3136	13.85
4426	B L <sub>2</sub> O	1.129	1.00	31,960	31,960	7.3124	14.69
4427	B L <sub>3</sub> M	1.129	1.00	31,590	31,590	7.3143	14.40
4428	B T <sub>9</sub> M	1.129	1.00	30,070	30,070	-----	-----

No. 854.

Marks,  $12 M R_{21} T R_{21}$   
B T<sub>1</sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00008	.00005	.....	.....	
4,000	4,000	.00013	.00005	.....	.....	
5,000	5,000	.00018	.00005	.00001	.00001	
6,000	6,000	.00024	.00006	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00035	.00005	.....	.....	
9,000	9,000	.00040	.00005	.....	.....	
10,000	10,000	.00046	.00006	.00001	0.	
11,000	11,000	.00051	.00005	.....	.....	
12,000	12,000	.00057	.00006	.....	.....	
13,000	13,000	.00062	.00005	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00073	.00005	.00001	.00003	
16,000	16,000	.00079	.00006	.....	.....	
17,000	17,000	.00087	.00008	.....	.....	
18,000	18,000	.00092	.00005	.....	.....	
19,000	19,000	.00101	.00009	.....	.....	
20,000	20,000	.00109	.00008	.00012	.00008	
21,000	21,000	.00116	.00007	.....	.....	
22,000	22,000	.00122	.00006	.....	.....	
23,000	23,000	.00130	.00008	.....	.....	
24,000	24,000	.00140	.00010	.....	.....	
25,000	25,000	.00150	.00010	.00027	.00015	
26,000	26,000	.00162	.00012	.....	.....	
27,000	27,000	.00176	.00014	.....	.....	
28,000	28,000	.00190	.00014	.....	.....	
29,000	29,000	.00206	.00016	.....	.....	
30,000	30,000	.00227	.00021	.00075	.00048	
31,000	31,000	.00246	.00019	.....	.....	
32,000	32,000	.00266	.00020	.....	.....	
33,000	33,000	.00290	.00024	.....	.....	
34,000	34,000	.00330	.00040	.....	.....	
35,000	35,000	.00372	.00042	.00192	.00117	
36,000	36,000	.00412	.00040	.....	.....	
37,000	37,000	.00448	.00036	.....	.....	
38,000	38,000	.00485	.00037	.....	.....	
39,000	39,000	.00537	.00052	.....	.....	
40,000	40,000	.00591	.00054	.00382	.00190	Ultimate strength.
50,400	50,400	.....	.....	.....	.....	

Failed by triple flexure.

Specific gravity, 7.3183.

Hardness, 14.69.



No. 855.

Marks,  $12 M R_{21} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00016	.00004	0.	.....	
6,000	6,000	.00022	.00006	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00032	.00006	.....	.....	
9,000	9,000	.00038	.00006	.....	.....	
10,000	10,000	.00044	.00006	0.	.....	
11,000	11,000	.00048	.00004	.....	.....	
12,000	12,000	.00054	.00006	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00072	.00008	.00006	.00006	
16,000	16,000	.00078	.00006	.....	.....	
17,000	17,000	.00084	.00006	.....	.....	
18,000	18,000	.00090	.00006	.....	.....	
19,000	19,000	.00098	.00008	.....	.....	
20,000	20,000	.00104	.00008	.00014	.00008	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00126	.00008	.....	.....	
24,000	24,000	.00138	.00012	.....	.....	
25,000	25,000	.00146	.00008	.00030	.00016	
26,000	26,000	.00158	.00008	.....	.....	
27,000	27,000	.00170	.00012	.....	.....	
28,000	28,000	.00184	.00014	.....	.....	
29,000	29,000	.00198	.00014	.....	.....	
30,000	30,000	.00220	.00022	.00094	.00064	
31,000	31,000	.00244	.00024	.....	.....	
32,000	32,000	.00264	.00020	.....	.....	
33,000	33,000	.00294	.00030	.....	.....	
34,000	34,000	.00334	.00040	.....	.....	
35,000	35,000	.00380	.00046	.00202	.00108	
36,000	36,000	.00414	.00034	.....	.....	
37,000	37,000	.00458	.00044	.....	.....	
38,000	38,000	.00502	.00044	.....	.....	
39,000	39,000	.00556	.00054	.....	.....	
40,000	40,000	.00620	.00064	.00414	.00212	
60,980	60,980	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 22.

No. 4124.

Marks,  $12 M R_{22} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	-----	-----	
3,000	3,000	.000105	.000050	-----	-----	
4,000	4,000	.000155	.000050	-----	-----	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000255	.000050	-----	-----	
7,000	7,000	.000305	.000050	-----	-----	
8,000	8,000	.000355	.000050	-----	-----	
9,000	9,000	.000410	.000055	-----	-----	
10,000	10,000	.000460	.000050	.000010	.000005	
11,000	11,000	.000515	.000055	-----	-----	
12,000	12,000	.000580	.000065	.000020	.000010	
13,000	13,000	.000640	.000060	-----	-----	
14,000	14,000	.000705	.000065	.000040	.000020	
15,000	15,000	.000780	.000075	-----	-----	
16,000	16,000	.000850	.000070	.000060	.000020	
17,000	17,000	.000915	.000085	-----	-----	
18,000	18,000	.001000	.000085	.000095	.000035	
19,000	19,000	.001090	.000090	-----	-----	
20,000	20,000	.001190	.000100	.000155	.000060	
21,000	21,000	.001290	.000100	-----	-----	
22,000	22,000	.001405	.000115	.000245	.000090	
23,000	23,000	.001520	.000115	-----	-----	
24,000	24,000	.001685	.000165	.000375	.000130	
25,000	25,000	.001875	.000190	.000490	.000115	
29,520	29,520	-----	-----	-----	-----	Tensile strength.

Fractured 1" from neck.

Appearance, granular mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{22} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4439	$M T_1 I$	1.129	1.00	32,040	32,040	7.3235	17.44
4440	$M T_1 O$	1.129	1.00	31,120	31,120	7.3278	16.73
4441	$M T_2 M$	1.129	1.00	31,530	31,530	7.3326	17.26
4442	$M T_2 O$	1.129	1.00	32,890	32,890	7.3279	15.59

No. 859.

Marks,  $^{12}MR_{22}TR_1$   
 $MT_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00019	.00004	0.	.....	
6,000	6,000	.00025	.00003	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00035	.00005	.....	.....	
9,000	9,000	.00040	.00005	.....	.....	
10,000	10,000	.00046	.00006	0.	.....	
11,000	11,000	.00050	.00004	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00061	.00005	.....	.....	
14,000	14,000	.00066	.00005	.....	.....	
15,000	15,000	.00072	.00006	.00004	.00004	
16,000	16,000	.00080	.00008	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00091	.00005	.....	.....	
19,000	19,000	.00099	.00008	.....	.....	
20,000	20,000	.00103	.00004	.00009	.00005	
21,000	21,000	.00109	.00006	.....	.....	
22,000	22,000	.00116	.00007	.....	.....	
23,000	23,000	.00120	.00004	.....	.....	
24,000	24,000	.00128	.00008	.....	.....	
25,000	25,000	.00134	.00006	.00016	.00007	
26,000	26,000	.00140	.00006	.....	.....	
27,000	27,000	.00148	.00008	.....	.....	
28,000	28,000	.00156	.00008	.....	.....	
29,000	29,000	.00163	.00007	.....	.....	
30,000	30,000	.00171	.00008	.00030	.00014	
31,000	31,000	.00181	.00010	.....	.....	
32,000	32,000	.00191	.00010	.....	.....	
33,000	33,000	.00205	.00014	.....	.....	
34,000	34,000	.00218	.00013	.....	.....	
35,000	35,000	.00232	.00014	.00062	.00032	
36,000	36,000	.00249	.00017	.....	.....	
37,000	37,000	.00265	.00016	.....	.....	
38,000	38,000	.00285	.00020	.....	.....	
39,000	39,000	.00308	.00023	.....	.....	
40,000	40,000	.00339	.00031	.00138	.00076	
57,160	57,160	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4122.

Marks,  $12 M R_{22} T R_2$   
B T<sub>1</sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000205	.000050	0.	.....	
6,000	6,000	.000265	.000060	.....	.....	
7,000	7,000	.000325	.000060	.....	.....	
8,000	8,000	.000385	.000060	.....	.....	
9,000	9,000	.000440	.000055	.....	.....	
10,000	10,000	.000505	.000065	.000035	.000035	
11,000	11,000	.000580	.000075	.....	.....	
12,000	12,000	.000650	.000070	.000055	.000020	
13,000	13,000	.000730	.000080	.....	.....	
14,000	14,000	.000790	.000060	.000090	.000035	
15,000	15,000	.000880	.000090	.....	.....	
16,000	16,000	.000975	.000095	.000130	.000040	
17,000	17,000	.001070	.000095	.....	.....	
18,000	18,000	.001185	.000115	.000210	.000030	
19,000	19,000	.001300	.000115	.....	.....	
20,000	20,000	.001450	.000150	.000350	.000140	
21,000	21,000	.001640	.000190	.....	.....	
22,000	22,000	.001790	.000150	.000550	.000200	
23,000	23,000	.002055	.000265	.....	.....	
24,000	24,000	.002340	.000285	.000910	.000360	
25,000	25,000	.002740	.000400	.001215	.000305	
26,520	26,520	.....	.....	.....	.....	Tensile strength.

Fractured  $3\frac{1}{4}$ " from neck.

Appearance, uniform granular.

Specific gravity, 7.3253.

Hardness, 15.75.

## No. 4123.

Marks,  $^{12}M R_{22} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation. per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	-----	-----	
3,000	3,000	.000110	.000055	-----	-----	
4,000	4,000	.000160	.000050	-----	-----	
5,000	5,000	.000215	.000055	.000005	.000005	
6,000	6,000	.000270	.000055	-----	-----	
7,000	7,000	.000330	.000060	-----	-----	
8,000	8,000	.000390	.000060	-----	-----	
9,000	9,000	.000455	.000065	-----	-----	
10,000	10,000	.000515	.000060	.000040	.000035	
11,000	11,000	.000585	.000070	-----	-----	
12,000	12,000	.000655	.000070	.000055	.000015	
13,000	13,000	.000735	.000080	-----	-----	
14,000	14,000	.000810	.000075	.000085	.000030	
15,000	15,000	.000890	.000080	-----	-----	
16,000	16,000	.000990	.000100	.000140	.000055	
17,000	17,000	.001085	.000095	-----	-----	
18,000	18,000	.001190	.000105	.000215	.000075	
19,000	19,000	.001330	.000140	-----	-----	
20,000	20,000	.001465	.000135	.000355	.000140	Tensile strength.
21,000	21,000	.001640	.000175	-----	-----	
22,000	22,000	.001865	.000225	.000590	.000235	
23,000	23,000	.002085	.000220	-----	-----	
24,000	24,000	.002435	.000350	.000985	.000395	
24,980	24,980	-----	-----	-----	-----	

Fractured 5" from neck.

Appearance, uniform granular, excepting at one place in the circumference coarse dark spangles.

## TENACITY SPECIMENS.

General marks,  $^{12}M R_{22} T R_2$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4433	B T <sub>3</sub> I	1.129	1.00	30,820	30,820	-----	-----
4434	B T <sub>4</sub> O	1.129	1.00	33,640	33,640	-----	-----
4435	B T <sub>5</sub> M	1.129	1.00	30,690	30,690	-----	-----
4436	B L <sub>6</sub> I	1.129	1.00	30,790	30,790	7.3248	15.07
4437	B L <sub>7</sub> O	1.129	1.00	31,510	31,510	7.3281	14.98
4438	B L <sub>8</sub> M	1.129	1.00	30,500	30,500	7.3269	14.06

No. 858.

Marks,  $^{12} M R_{20} T R_2$   
 $B T_9$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	-----	-----	
3,000	3,000	.00010	.00006	-----	-----	
4,000	4,000	.00015	.00005	-----	-----	
5,000	5,000	.00021	.00006	0.	-----	
6,000	6,000	.00028	.00007	-----	-----	
7,000	7,000	.00033	.00005	-----	-----	
8,000	8,000	.00038	.00005	-----	-----	
9,000	9,000	.00043	.00005	-----	-----	
10,000	10,000	.00049	.00006	.00004	.00004	
11,000	11,000	.00055	.00006	-----	-----	
12,000	12,000	.00061	.00006	-----	-----	
13,000	13,000	.00066	.00005	-----	-----	
14,000	14,000	.00072	.00006	-----	-----	
15,000	15,000	.00078	.00006	.00010	.00006	
16,000	16,000	.00083	.00005	-----	-----	
17,000	17,000	.00092	.00009	-----	-----	
18,000	18,000	.00098	.00006	-----	-----	
19,000	19,000	.00103	.00005	-----	-----	
20,000	20,000	.00110	.00007	.00014	.00004	
21,000	21,000	.00117	.00007	-----	-----	
22,000	22,000	.00124	.00007	-----	-----	
23,000	23,000	.00132	.00008	-----	-----	
24,000	24,000	.00140	.00008	-----	-----	
25,000	25,000	.00151	.00011	.00029	.00015	
26,000	26,000	.00162	.00011	-----	-----	
27,000	27,000	.00172	.00010	-----	-----	
28,000	28,000	.00186	.00014	-----	-----	
29,000	29,000	.00200	.00014	-----	-----	
30,000	30,000	.00220	.00020	.00072	.00043	
31,000	31,000	.00240	.00020	-----	-----	
32,000	32,000	.00257	.00017	-----	-----	
33,000	33,000	.00282	.00025	-----	-----	
34,000	34,000	.00322	.00040	-----	-----	
35,000	35,000	.00352	.00030	.00177	.00105	
36,000	36,000	.00402	.00050	-----	-----	
37,000	37,000	.00432	.00029	-----	-----	
38,000	38,000	.00472	.00041	-----	-----	
39,000	39,000	.00517	.00045	-----	-----	
40,000	40,000	.00580	.00063	.00371	.00194	
52,250	52,250	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

No. 857.

Marks,  ${}^{12}M R_{10} T R_2$ 

Length, 10'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00038	.00004	.....	.....	
10,000	10,000	.00046	.00008	.00002	.00002	
11,000	11,000	.00050	.00004	.....	.....	
12,000	12,000	.00054	.00004	.....	.....	
13,000	13,000	.00062	.00005	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00074	.00006	.00008	.00006	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00094	.00008	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00106	.00006	.00014	.00006	
21,000	21,000	.00114	.00008	.....	.....	
22,000	22,000	.00118	.00004	.....	.....	
23,000	23,000	.00128	.00010	.....	.....	
24,000	24,000	.00138	.00010	.....	.....	
25,000	25,000	.00148	.00010	.00026	.00012	
26,000	26,000	.00158	.00010	.....	.....	
27,000	27,000	.00168	.00010	.....	.....	
28,000	28,000	.00182	.00014	.....	.....	
29,000	29,000	.00198	.00016	.....	.....	
30,000	30,000	.00220	.00022	.00072	.00046	
31,000	31,000	.00234	.00014	.....	.....	
32,000	32,000	.00258	.00024	.....	.....	
33,000	33,000	.00284	.00026	.....	.....	
34,000	34,000	.00318	.00034	.....	.....	
35,000	35,000	.00360	.00042	.00184	.00112	
36,000	36,000	.00394	.00034	.....	.....	
37,000	37,000	.00448	.00054	.....	.....	
38,000	38,000	.00480	.00032	.....	.....	
39,000	39,000	.00532	.00052	.....	.....	
40,000	40,000	.00584	.00052	.00376	.00192	Ultimate strength.
62,540	62,540	.....	.....	.....	.....	

Failed by triple flexure.

## CAST-IRON BODY, No. 23.

No. 4152.

Marks,  $12 M R_{23} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000305	.000055	-----	-----	
8,000	8,000	.000360	.000055	-----	-----	
9,000	9,000	.000420	.000060	-----	-----	
10,000	10,000	.000475	.000055	.000020	.000020	
11,000	11,000	.000525	.000050	-----	-----	
12,000	12,000	.000600	.000075	.000050	.000030	
13,000	13,000	.000660	.000060	-----	-----	
14,000	14,000	.000730	.000070	.000055	.000005	
15,000	15,000	.000800	.000070	-----	-----	
16,000	16,000	.000865	.000065	.000085	.000030	Tensile strength.
17,000	17,000	.000935	.000070	-----	-----	
18,000	18,000	.001020	.000085	.000120	.000035	
19,000	19,000	.001115	.000095	-----	-----	
20,000	20,000	.001215	.000100	.000175	.000055	
21,000	21,000	.001305	.000090	-----	-----	
22,000	22,000	.001420	.000115	.000260	.000085	
23,000	23,000	.001530	.000110	-----	-----	
24,000	24,000	.001665	.000135	.000370	.000110	
25,000	25,000	.001845	.000180	.000470	.000100	
30,480	30,480	-----	-----	-----	-----	

Fractured  $2\frac{1}{4}$ " from neck.

Appearance, granular mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{23} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4450	M T <sub>3</sub> I	1.129	1.00	33,470	33,470	7.3137	16.82
4451	M T <sub>4</sub> O	1.129	1.00	29,210	29,210	7.3153	16.56
4452	M T <sub>5</sub> M	1.129	1.00	32,640	32,640	7.3288	17.62
4453	M T <sub>6</sub> O	1.129	1.00	32,390	32,390	7.3101	16.23



No. 862.

Marks,  $^{12} M R_{21} T R_1$   
 $M T_1$ 

Length, 12''.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Gauged length, 10''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00004	.00004	.....	.....	
4,000	4,000	.00013	.00004	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00023	.00005	.....	.....	
7,000	7,000	.00028	.00005	.....	.....	
8,000	8,000	.00033	.00005	.....	.....	
9,000	9,000	.00039	.00006	.....	.....	
10,000	10,000	.00044	.00005	.00001	.00001	
11,000	11,000	.00049	.00005	.....	.....	
12,000	12,000	.00054	.00005	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00070	.00006	.00005	.00004	
16,000	16,000	.00076	.00006	.....	.....	
17,000	17,000	.00082	.00006	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00093	.00005	.....	.....	
20,000	20,000	.00101	.00008	.00009	.00004	
21,000	21,000	.00106	.00005	.....	.....	
22,000	22,000	.00112	.00006	.....	.....	
23,000	23,000	.00118	.00006	.....	.....	
24,000	24,000	.00123	.00005	.....	.....	
25,000	25,000	.00130	.00007	.00015	.00006	
26,000	26,000	.00138	.00008	.....	.....	
27,000	27,000	.00144	.00006	.....	.....	
28,000	28,000	.00152	.00008	.....	.....	
29,000	29,000	.00160	.00008	.....	.....	
30,000	30,000	.00167	.00007	.00026	.00011	
31,000	31,000	.00175	.00008	.....	.....	
32,000	32,000	.00184	.00009	.....	.....	
33,000	33,000	.00195	.00011	.....	.....	
34,000	34,000	.00205	.00010	.....	.....	
35,000	35,000	.00218	.00013	.00051	.00025	
36,000	36,000	.00232	.00014	.....	.....	
37,000	37,000	.00247	.00015	.....	.....	
38,000	38,000	.00262	.00015	.....	.....	
39,000	39,000	.00282	.00020	.....	.....	
40,000	40,000	.00307	.00025	.00112	.00061	
57,940	57,940	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4126.

Marks,  $12M_{R_{27}}TR_2$   
 $B_{T_2}$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000110	.000055	.....	.....	
4,000	4,000	.000160	.000050	.....	.....	
5,000	5,000	.000215	.000055	0.	.....	
6,000	6,000	.000265	.000050	.....	.....	
7,000	7,000	.000330	.000065	.....	.....	
8,000	8,000	.000390	.000060	.....	.....	
9,000	9,000	.000455	.000065	.....	.....	
10,000	10,000	.000515	.000060	.000020	.000020	
11,000	11,000	.000580	.000065	.....	.....	
12,000	12,000	.000660	.000080	.000040	.000020	
13,000	13,000	.000730	.000070	.....	.....	
14,000	14,000	.000810	.000080	.000090	.000050	
15,000	15,000	.000890	.000080	.....	.....	
16,000	16,000	.001000	.000110	.000135	.000045	
17,000	17,000	.001100	.000100	.....	.....	
18,000	18,000	.001215	.000115	.000205	.000070	
19,000	19,000	.001350	.000135	.....	.....	
20,000	20,000	.001490	.000140	.000340	.000135	
21,000	21,000	.001675	.000185	.....	.....	
22,000	22,000	.001875	.000200	.000570	.000230	
23,000	23,000	.002140	.000265	.....	.....	
24,000	24,000	.002450	.000310	.000950	.000380	
25,000	25,000	.002925	.000475	.001330	.000380	
26,140	26,140	.....	.....	.....	.....	Tensile strength.

Appearance, uniform granular.

Fractured 3".75 from neck.

No. 4127.

Marks,  $12 M R_{22} T R_2$   
 $B T_{11}$ Length of stem,  $9\frac{1}{4}$ ".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	-----	-----	
3,000	3,000	.000120	.000060	-----	-----	
4,000	4,000	.000180	.000060	-----	-----	
5,000	5,000	.000240	.000060	0.	-----	
6,000	6,000	.000280	.000040	-----	-----	
7,000	7,000	.000320	.000040	-----	-----	
8,000	8,000	.000380	.000060	-----	-----	
9,000	9,000	.000440	.000060	-----	-----	
10,000	10,000	.000500	.000060	.000040	.000040	
11,000	11,000	.000580	.000080	-----	-----	
12,000	12,000	.000680	.000100	.000060	.000020	
13,000	13,000	.000760	.000080	-----	-----	
14,000	14,000	.000840	.000080	.000100	.000040	
15,000	15,000	.000900	.000060	-----	-----	
16,000	16,000	.001000	.000100	.000160	.000060	
17,000	17,000	.001100	.000100	-----	-----	
18,000	18,000	.001200	.000100	.000200	.000040	
19,000	19,000	.001300	.000100	-----	-----	
20,000	20,000	.001400	.000160	.000340	.000140	Tensile strength.
21,000	21,000	.001640	.000180	-----	-----	
22,000	22,000	.001780	.000140	.000540	.000200	
23,000	23,000	.002040	.000260	-----	-----	
24,000	24,000	.002300	.000260	.000860	.000340	
25,000	25,000	.002640	.000340	.001160	.000280	
30,710	30,710	-----	-----	-----	-----	

Fractured 4."25 from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{23} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4443	B T <sub>3</sub> I	1.129	1.00	29,970	29,970	-----	-----
4444	B T <sub>4</sub> O	1.129	1.00	33,700	33,700	7.3074	14.90
4445	B T <sub>5</sub> M	1.129	1.00	31,560	31,560	-----	-----
4446	B L <sub>6</sub> I	1.129	1.00	29,810	29,810	7.3121	14.90
4447	B L <sub>7</sub> O	1.129	1.00	33,050	33,050	7.3127	14.76
4448	B L <sub>8</sub> M	1.129	1.00	32,020	32,020	7.3136	15.05
4449	B T <sub>9</sub> M	1.129	1.00	30,040	30,040	-----	-----

No. 860.

Marks,  ${}^{12}M R_{23} T R_2$   
 ${}^{11}T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00011	.00005	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00021	.00005	0.	.....	
6,000	6,000	.00026	.00005	.....	.....	
7,000	7,000	.00032	.00006	.....	.....	
8,000	8,000	.00037	.00005	.....	.....	
9,000	9,000	.00042	.00005	.....	.....	
10,000	10,000	.00050	.00008	.00003	.00003	
11,000	11,000	.00056	.00006	.....	.....	
12,000	12,000	.00061	.00005	.....	.....	
13,000	13,000	.00068	.00007	.....	.....	
14,000	14,000	.00075	.00007	.....	.....	
15,000	15,000	.00081	.00006	.00009	.00006	
16,000	16,000	.00087	.00006	.....	.....	
17,000	17,000	.00092	.00005	.....	.....	
18,000	18,000	.00099	.00007	.....	.....	
19,000	19,000	.00107	.00008	.....	.....	
20,000	20,000	.00116	.00009	.00018	.00009	
21,000	21,000	.00122	.00006	.....	.....	
22,000	22,000	.00131	.00009	.....	.....	
23,000	23,000	.00140	.00009	.....	.....	
24,000	24,000	.00150	.00010	.....	.....	
25,000	25,000	.00161	.00011	.00034	.00016	
26,000	26,000	.00171	.00010	.....	.....	
27,000	27,000	.00181	.00010	.....	.....	
28,000	28,000	.00196	.00017	.....	.....	
29,000	29,000	.00212	.00016	.....	.....	
30,000	30,000	.00229	.00017	.00077	.00043	
31,000	31,000	.00247	.00018	.....	.....	
32,000	32,000	.00267	.00020	.....	.....	
33,000	33,000	.00292	.00025	.....	.....	
34,000	34,000	.00324	.00032	.....	.....	
35,000	35,000	.00368	.00044	.00178	.00101	
36,000	36,000	.00392	.00024	.....	.....	
37,000	37,000	.00428	.00036	.....	.....	
38,000	38,000	.00474	.00016	.....	.....	
39,000	39,000	.00527	.00053	.....	.....	
40,000	40,000	.00578	.00051	.00363	.00185	
52,300	52,300	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 861.

Marks,  $12 M R_{23} T R,$   
 $B R_{10}$ 

Length, 10'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006			
3,000	3,000	.00010	.00004			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00030	.00006			
8,000	8,000	.00036	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00046	.00006	.00004	.00004	
11,000	11,000	.00052	.00006			
12,000	12,000	.00058	.00006			
13,000	13,000	.00064	.00006			
14,000	14,000	.00070	.00006			
15,000	15,000	.00078	.00008	.00010	.00006	
16,000	16,000	.00082	.00004			
17,000	17,000	.00088	.00006			
18,000	18,000	.00094	.00006			
19,000	19,000	.00102	.00008			
20,000	20,000	.00110	.00008	.00016	.00006	
21,000	21,000	.00118	.00008			
22,000	22,000	.00124	.00006			
23,000	23,000	.00132	.00008			
24,000	24,000	.00140	.00008			
25,000	25,000	.00150	.00010	.00030	.00014	
26,000	26,000	.00160	.00010			
27,000	27,000	.00170	.00010			
28,000	28,000	.00184	.00014			
29,000	29,000	.00196	.00012			
30,000	30,000	.00212	.00016	.00064	.00034	
31,000	31,000	.00232	.00020			
32,000	32,000	.00252	.00020			
33,000	33,000	.00274	.00022			
34,000	34,000	.00302	.00028			
35,000	35,000	.00340	.00038	.00164	.00100	
36,000	36,000	.00374	.00034			
37,000	37,000	.00404	.00030			
38,000	38,000	.00448	.00044			
39,000	39,000	.00492	.00044			
40,000	40,000	.00554	.00062	.00352	.00188	
61,460	61,460					Ultimate strength.

Failed by triple flexure.

H. Ex. 165—20

## CAST-IRON BODY, NO. 24.

No. 4160.

Marks,  $^{12} M R_{24} T R_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000255	.000050	.....	.....	
7,000	7,000	.000305	.000050	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000410	.000055	.....	.....	
10,000	10,000	.000470	.000060	.000025	.000025	
11,000	11,000	.000525	.000055	.....	.....	
12,000	12,000	.000585	.000060	.000035	.000010	
13,000	13,000	.000650	.000065	.....	.....	
14,000	14,000	.000710	.000060	.000050	.000015	
15,000	15,000	.000775	.000065	.....	.....	
16,000	16,000	.000835	.000080	.000085	.000035	
17,000	17,000	.000815	.000060	.....	.....	
18,000	18,000	.001005	.000090	.000105	.000020	
19,000	19,000	.001090	.000085	.....	.....	
20,000	20,000	.001170	.000080	.000160	.000055	
21,000	21,000	.001265	.000095	.....	.....	
22,000	22,000	.001385	.000120	.000240	.000080	
23,000	23,000	.001505	.000120	.....	.....	
24,000	24,000	.001635	.000130	.000360	.000120	
25,000	25,000	.001800	.000165	.000450	.000090	
29,580	29,580	.....	.....	.....	.....	Tensile strength.

Fractured 11" from neck.

Appearance, granular, with coarse, dark-colored spangles.

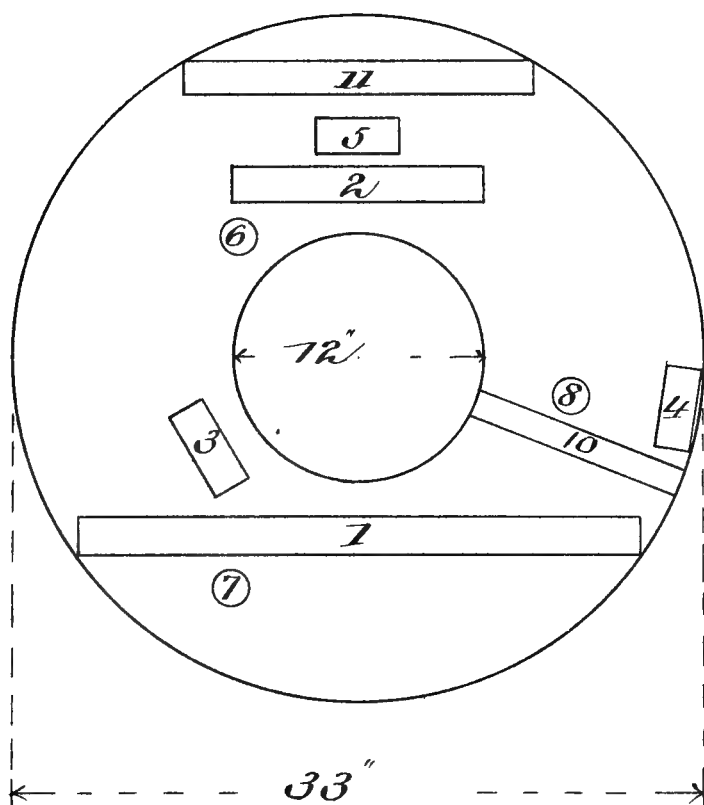
## TENACITY SPECIMENS.

General marks,  $^{12} M R_{24} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4454	$M T_3 I$	1.129	1.00	32,980	32,980	7.3230	19.08
4455	$M T_4 O$	1.129	1.00	32,960	32,960	7.3184	17.62
4456	$M T_5 M$	1.129	1.00	32,210	32,210	7.3321	18.28
4457	$M T_6 O$	1.129	1.00	34,270	34,270	7.3203	16.99

# *12-inch B.L. Rifled Mortars*

*Cast Iron Bodies Nos. 24, 26,  
27, 28, 29, 30 and 31.  
Breech Discs.*







No. 863.

Marks,  $12 M R_2 T R_1$   
 $M T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004			
3,000	3,000	.00009	.00005			
4,000	4,000	.00014	.00005			
5,000	5,000	.00019	.00005	0.		
6,000	6,000	.00024	.00005			
7,000	7,000	.00029	.00005			
8,000	8,000	.00033	.00004			
9,000	9,000	.00038	.00005			
10,000	10,000	.00043	.00005	.00001	.00001	
11,000	11,000	.00048	.00005			
12,000	12,000	.00052	.00004			
13,000	13,000	.00059	.00007			
14,000	14,000	.00064	.00005			
15,000	15,000	.00069	.00005	.00005	.00004	
16,000	16,000	.00075	.00006			
17,000	17,000	.00082	.00007			
18,000	18,000	.00087	.00005			
19,000	19,000	.00092	.00005			
20,000	20,000	.00088	.00006	.00008	.00003	
21,000	21,000	.00103	.00005			
22,000	22,000	.00109	.00006			
23,000	23,000	.00116	.00007			
24,000	24,000	.00122	.00006			
25,000	25,000	.00128	.00006	.00014	.00006	
26,000	26,000	.00136	.00008			
27,000	27,000	.00142	.00006			
28,000	28,000	.00149	.00007			
29,000	29,000	.00157	.00008			
30,000	30,000	.00163	.00006	.00023	.00009	
31,000	31,000	.00171	.00008			
32,000	32,000	.00180	.00009			
33,000	33,000	.00191	.00011			
34,000	34,000	.00201	.00010			
35,000	35,000	.00212	.00011	.00043	.00020	
36,000	36,000	.00224	.00012			
37,000	37,000	.00235	.00011			
38,000	38,000	.00248	.00013			
39,000	39,000	.00264	.00016			
40,000	40,000	.00282	.00018	.00088	.00045	
58,560	58,560					Ultimate strength.

Failed by triple flexure.

No. 4161.

Marks,  $^{12} M R_2 T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	0.	.....	
6,000	6,000	.000260	.000050	.....	.....	
7,000	7,000	.000320	.000060	.....	.....	
8,000	8,000	.000385	.000065	.....	.....	
9,000	9,000	.000450	.000065	.....	.....	
10,000	10,000	.000510	.000060	.000040	.000040	
11,000	11,000	.000575	.000065	.....	.....	
12,000	12,000	.000645	.000070	.000050	.000010	
13,000	13,000	.000720	.000075	.....	.....	
14,000	14,000	.000800	.000080	.000075	.000025	
15,000	15,000	.000885	.000085	.....	.....	
16,000	16,000	.000965	.000080	.000135	.000060	
17,000	17,000	.001060	.000095	.....	.....	
18,000	18,000	.001185	.000125	.000195	.000060	
19,000	19,000	.001290	.000105	.....	.....	
20,000	20,000	.001410	.000120	.000295	.000100	
21,000	21,000	.001585	.000175	.....	.....	
22,000	22,000	.001755	.000170	.000475	.000180	
23,000	23,000	.001950	.000195	.....	.....	
24,000	24,000	.002200	.000250	.000760	.000285	
25,000	25,000	.002505	.000305	.000995	.000235	
29,030	29,030	.....	.....	.....	.....	Tensile strength.

Fractured  $2\frac{1}{2}$ " from neck.

Appearance, uniform granular.

No. 4162.

Marks,  $12 M R_{24} T R_2$   
 $B T_{11}$ 

Length of stem, 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	-----	-----	
3,000	3,000	.00011	.00005	-----	-----	
4,000	4,000	.00016	.00005	-----	-----	
5,000	5,000	.00022	.00006	0.	-----	
6,000	6,000	.00028	.00006	-----	-----	
7,000	7,000	.00033	.00005	-----	-----	
8,000	8,000	.00039	.00006	-----	-----	
9,000	9,000	.00046	.00007	-----	-----	
10,000	10,000	.00052	.00006	.00002	.00002	
11,000	11,000	.00058	.00006	-----	-----	
12,000	12,000	.00065	.00007	.00004	.00002	
13,000	13,000	.00072	.00007	-----	-----	
14,000	14,000	.00082	.00010	.00008	.00004	
15,000	15,000	.00089	.00007	-----	-----	
16,000	16,000	.00100	.00011	.00012	.00004	
17,000	17,000	.00110	.00010	-----	-----	
18,000	18,000	.00122	.00012	.00021	.00009	
19,000	19,000	.00136	.00014	-----	-----	
20,000	20,000	.00151	.00015	.00037	.00016	
21,000	21,000	.00169	.00018	-----	-----	
22,000	22,000	.00190	.00021	.00059	.00022	
23,000	23,000	.00218	.00028	-----	-----	
24,000	24,000	.00248	.00030	.00100	.00041	
25,000	25,000	.00288	.00040	.00130	.00030	
29,990	29,990	-----	-----	-----	-----	Tensile strength.

Fractured 7" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{24} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
4458	B T <sub>3</sub> I	<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4459	B T <sub>4</sub> O	1.129	1.00	30,910	30,910	-----	-----
4460	B T <sub>5</sub> M	1.129	1.00	32,990	32,990	7.3153	15.51
4461	B L <sub>6</sub> I	1.129	1.00	32,450	32,450	-----	-----
4462	B L <sub>7</sub> O	1.129	1.00	33,920	33,920	7.3160	15.51
4463	B L <sub>8</sub> M	1.129	1.00	31,030	31,030	7.3148	15.28
				32,650	32,650	7.3183	15.43

No. 864.

Marks,  $12 M R_{24} T R_2$   
B T<sub>2</sub>

Length, 12'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00008	.00005	.....	.....	
4,000	4,000	.00013	.00005	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00023	.00005	.....	.....	
7,000	7,000	.00028	.00005	.....	.....	
8,000	8,000	.00033	.00005	.....	.....	
9,000	9,000	.00038	.00005	.....	.....	
10,000	10,000	.00044	.00006	.00001	.0001	
11,000	11,000	.00049	.00005	.....	.....	
12,000	12,000	.00055	.00006	.....	.....	
13,000	13,000	.00061	.00006	.....	.....	
14,000	14,000	.00068	.00007	.....	.....	
15,000	15,000	.00073	.00005	.00006	.00005	
16,000	16,000	.00078	.00005	.....	.....	
17,000	17,000	.00084	.00006	.....	.....	
18,000	18,000	.00092	.00008	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00104	.00006	.00011	.00005	
21,000	21,000	.00111	.00007	.....	.....	
22,000	22,000	.00117	.00006	.....	.....	
23,000	23,000	.00123	.00006	.....	.....	
24,000	24,000	.00130	.00007	.....	.....	
25,000	25,000	.00138	.00008	.00022	.00011	
26,000	26,000	.00148	.00010	.....	.....	
27,000	27,000	.00157	.00009	.....	.....	
28,000	28,000	.00166	.00009	.....	.....	
29,000	29,000	.00176	.00010	.....	.....	
30,000	30,000	.00187	.00011	.00042	.00020	
31,000	31,000	.00201	.00014	.....	.....	
32,000	32,000	.00214	.00014	.....	.....	
33,000	33,000	.00228	.00014	.....	.....	
34,000	34,000	.00248	.00020	.....	.....	
35,000	35,000	.00269	.00021	.00100	.00058	
36,000	36,000	.00302	.00033	.....	.....	
37,000	37,000	.00323	.00021	.....	.....	
38,000	38,000	.00357	.00034	.....	.....	
39,000	39,000	.00392	.00035	.....	.....	
40,000	40,000	.00442	.00050	.00240	.00140	
54,190	54,190	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 865.

Marks,  $12 M R_{24} T R_2$   
 $B R_{10}$ 

Length, 10'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00008	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00030	.00004	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00046	.00004	.00004	.00004	
11,000	11,000	.00050	.00004	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00060	.00004	.....	.....	
14,000	14,000	.00066	.00006	.....	.....	
15,000	15,000	.00074	.00008	.00006	.00002	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00084	.00004	.....	.....	
18,000	18,000	.00090	.00006	.....	.....	
19,000	19,000	.00096	.00006	.....	.....	
20,000	20,000	.00106	.00010	.00012	.00006	
21,000	21,000	.00110	.00004	.....	.....	
22,000	22,000	.00118	.00008	.....	.....	
23,000	23,000	.00126	.00008	.....	.....	
24,000	24,000	.00134	.00008	.....	.....	
25,000	25,000	.00144	.00010	.00024	.00012	
26,000	26,000	.00154	.00010	.....	.....	
27,000	27,000	.00164	.00010	.....	.....	
28,000	28,000	.00174	.00010	.....	.....	
29,000	29,000	.00188	.00014	.....	.....	
30,000	30,000	.00202	.00014	.00060	.00036	
31,000	31,000	.00226	.00024	.....	.....	
32,000	32,000	.00242	.00016	.....	.....	
33,000	33,000	.00266	.00024	.....	.....	
34,000	34,000	.00296	.00030	.....	.....	
35,000	35,000	.00330	.00034	.00156	.00096	
36,000	36,000	.00370	.00040	.....	.....	
37,000	37,000	.00406	.00036	.....	.....	
38,000	38,000	.00446	.00040	.....	.....	
39,000	39,000	.00496	.00050	.....	.....	
40,000	40,000	.00546	.00050	.00344	.00188	
64,580	64,580	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 25.

No. 4165.

Marks,  $12 M R_{25} T R_1$   
 $M T_3$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000355	.000055	.....	.....	
9,000	9,000	.000410	.000055	.....	.....	
10,000	10,000	.000480	.000070	.000015	.000015	
11,000	11,000	.000535	.000055	.....	.....	
12,000	12,000	.000605	.000070	.000020	.000005	
13,000	13,000	.000660	.000055	.....	.....	
14,000	14,000	.000735	.000075	.000065	.000045	
15,000	15,000	.000810	.000075	.....	.....	
16,000	16,000	.000900	.000090	.000110	.000055	
17,000	17,000	.000990	.000090	.....	.....	
18,000	18,000	.001100	.000110	.000190	.000080	
19,000	19,000	.001205	.000105	.....	.....	
20,000	20,000	.001345	.000140	.000305	.000115	
21,000	21,000	.001500	.000155	.....	.....	
22,000	22,000	.001680	.000180	.000500	.000195	
23,000	23,000	.001935	.000255	.....	.....	
24,000	24,000	.002210	.000275	.000875	.000375	
25,000	25,000	.002625	.000415	.001200	.000325	
28,480	28,480	.....	.....	.....	.....	Tensile strength.

Fractured 2" from neck.

Appearance, granular mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{25} T R_1$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4470	$M T_3 I$	1.129	1.00	32,590	32,590	7.3094	16.56
4471	$M T_4 O$	1.129	1.00	30,740	30,740	7.3072	14.98
4472	$M T_5 M$	1.129	1.00	29,930	29,930	7.3093	15.20
4473	$M T_6 O$	1.129	1.00	33,470	33,470	7.3003	15.51

No. 869.

Marks,  $12 M R_{25} T R_1$   
 $M T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00034	.00004	.....	.....	
9,000	9,000	.00039	.00005	.....	.....	
10,000	10,000	.00044	.00005	.00002	.00002	
11,000	11,000	.00049	.00005	.....	.....	
12,000	12,000	.00054	.00005	.....	.....	
13,000	13,000	.00059	.00005	.....	.....	
14,000	14,000	.00065	.00006	.....	.....	
15,000	15,000	.00070	.00005	.00005	.00003	
16,000	16,000	.00075	.00005	.....	.....	
17,000	17,000	.00080	.00006	.....	.....	
18,000	18,000	.00088	.00007	.....	.....	
19,000	19,000	.00095	.00007	.....	.....	
20,000	20,000	.00100	.00005	.00012	.00007	
21,000	21,000	.00105	.00005	.....	.....	
22,000	22,000	.00112	.00007	.....	.....	
23,000	23,000	.00120	.00008	.....	.....	
24,000	24,000	.00128	.00008	.....	.....	
25,000	25,000	.00136	.00008	.00022	.00010	
26,000	26,000	.00145	.00009	.....	.....	
27,000	27,000	.00157	.00012	.....	.....	
28,000	28,000	.00168	.00011	.....	.....	
29,000	29,000	.00179	.00011	.....	.....	
30,000	30,000	.00196	.00017	.00059	.00037	
31,000	31,000	.00213	.00017	.....	.....	
32,000	32,000	.00231	.00018	.....	.....	
33,000	33,000	.00251	.00020	.....	.....	
34,000	34,000	.00279	.00027	.....	.....	
35,000	35,000	.00321	.00042	.00155	.00096	
36,000	36,000	.00355	.00034	.....	.....	
37,000	37,000	.00382	.00037	.....	.....	
38,000	38,000	.00437	.00045	.....	.....	
39,000	39,000	.00485	.00048	.....	.....	
40,000	40,000	.00538	.00053	.00345	.00190	
51,290	51,290	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4163.

Marks,  $^{12} M R_{26} T R_2$   
 $B T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000305	.000055	.....	.....	
8,000	8,000	.000360	.000055	.....	.....	
9,000	9,000	.000420	.000060	.....	.....	
10,000	10,000	.000485	.000065	.000015	.000015	
11,000	11,000	.000540	.000055	.....	.....	
12,000	12,000	.000605	.000065	.000035	.000020	
13,000	13,000	.000665	.000060	.....	.....	
14,000	14,000	.000735	.000070	.000055	.000020	
15,000	15,000	.000805	.000070	.....	.....	
16,000	16,000	.000890	.000085	.000090	.000035	
17,000	17,000	.000960	.000070	.....	.....	
18,000	18,000	.001060	.000100	.000145	.000055	
19,000	19,000	.001155	.000095	.....	.....	
20,000	20,000	.001260	.000105	.000220	.000075	
21,000	21,000	.001395	.000135	.....	.....	
22,000	22,000	.001525	.000130	.000350	.000130	
23,000	23,000	.001690	.000165	.....	.....	
24,000	24,000	.002390	.000700	.000560	.000210	
25,000	25,000	.002640	.000250	.000735	.000175	
29,620	29,620	.....	.....	.....	.....	Tensile strength.

Fractured  $5\frac{1}{2}$ " from neck.

Appearance, uniform granular.



No. 4164.

Marks,  $12 M R_{25} T R_2$   
 $B T_{11}$ 

Length of stem, 11".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00031	.00006	.....	.....	
8,000	8,000	.00037	.00006	.....	.....	
9,000	9,000	.00043	.00006	.....	.....	
10,000	10,000	.00049	.00006	0.	.....	
11,000	11,000	.00055	.00006	.....	.....	
12,000	12,000	.00061	.00006	.00002	.00002	
13,000	13,000	.00068	.00007	.....	.....	
14,000	14,000	.00076	.00008	.00006	.00004	
15,000	15,000	.00083	.00007	.....	.....	
16,000	16,000	.00092	.00009	.00011	.00005	
17,000	17,000	.00101	.00009	.....	.....	
18,000	18,000	.00111	.00010	.00017	.00006	
19,000	19,000	.00121	.00010	.....	.....	
20,000	20,000	.00132	.00011	.00027	.00010	Tensile strength.
21,000	21,000	.00147	.00015	.....	.....	
22,000	22,000	.00165	.00018	.00042	.00015	
23,000	23,000	.00184	.00019	.....	.....	
24,000	24,000	.00206	.00022	.00068	.00026	
25,000	25,000	.00238	.00032	.00092	.00024	
32,410	32,410	.....	.....	.....	.....	

Fractured 1" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{25} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4404	B T <sub>3</sub> I	1.129	1.00	33,720	33,720	.....	.....
4485	B T <sub>4</sub> O	1.129	1.00	33,560	33,560	7.2991	15.28
4466	B T <sub>5</sub> M	1.129	1.00	34,130	34,130	.....	.....
4467	B L <sub>6</sub> I	1.129	1.00	33,890	33,890	7.3073	16.23
4468	B L <sub>7</sub> O	1.129	1.00	35,830	35,830	7.3104	16.23
4460	B L <sub>8</sub> M	1.129	1.00	37,600	37,600	7.3158	15.75

No. 866.

Marks,  $12 M R_{25} T R_2$   
 $B T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	.00001	.00001	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00032	.00006	.....	.....	
8,000	8,000	.00037	.00005	.....	.....	
9,000	9,000	.00042	.00005	.....	.....	
10,000	10,000	.00047	.00005	.00003	.00002	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00063	.00005	.....	.....	
14,000	14,000	.00068	.00005	.....	.....	
15,000	15,000	.00074	.00006	.00008	.00005	
16,000	16,000	.00081	.00007	.....	.....	
17,000	17,000	.00086	.00005	.....	.....	
18,000	18,000	.00092	.00006	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00104	.00006	.00012	.00004	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00117	.00005	.....	.....	
23,000	23,000	.00125	.00008	.....	.....	
24,000	24,000	.00133	.00008	.....	.....	
25,000	25,000	.00142	.00009	.00023	.00011	
26,000	26,000	.00152	.00010	.....	.....	
27,000	27,000	.00160	.00008	.....	.....	
28,000	28,000	.00170	.00010	.....	.....	
29,000	29,000	.00182	.00012	.....	.....	
30,000	30,000	.00194	.00012	.00052	.00029	
31,000	31,000	.00212	.00018	.....	.....	
32,000	32,000	.00224	.00012	.....	.....	
33,000	33,000	.00244	.00020	.....	.....	
34,000	34,000	.00266	.00022	.....	.....	
35,000	35,000	.00286	.00030	.00128	.00076	
36,000	36,000	.00323	.00027	.....	.....	
37,000	37,000	.00348	.00025	.....	.....	
38,000	38,000	.00385	.00037	.....	.....	
39,000	39,000	.00428	.00043	.....	.....	
40,000	40,000	.00468	.00040	.00270	.00142	
52,150	52,150	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 867.

Marks,  $12 M R_{25} T R_2$   
B T<sub>9</sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00009	.00005	.....	.....	
4,000	4,000	.00014	.00005	.....	.....	
5,000	5,000	.00019	.00005	.00001	.00001	
6,000	6,000	.00024	.00005	.....	.....	
7,000	7,000	.00029	.00005	.....	.....	
8,000	8,000	.00034	.00005	.....	.....	
9,000	9,000	.00039	.00005	.....	.....	
10,000	10,000	.00044	.00005	.00001	0.	
11,000	11,000	.00049	.00005	.....	.....	
12,000	12,000	.00054	.00005	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00065	.00005	.....	.....	
15,000	15,000	.00070	.00005	.00008	.00007	
16,000	16,000	.00076	.00006	.....	.....	
17,000	17,000	.00082	.00006	.....	.....	
18,000	18,000	.00089	.00007	.....	.....	
19,000	19,000	.00094	.00005	.....	.....	
20,000	20,000	.00101	.00007	.00012	.00004	
21,000	21,000	.00108	.00007	.....	.....	
22,000	22,000	.00113	.00005	.....	.....	
23,000	23,000	.00122	.00009	.....	.....	
24,000	24,000	.00128	.00006	.....	.....	
25,000	25,000	.00137	.00009	.00022	.00010	
26,000	26,000	.00149	.00012	.....	.....	
27,000	27,000	.00157	.00008	.....	.....	
28,000	28,000	.00165	.00008	.....	.....	
29,000	29,000	.00176	.00011	.....	.....	
30,000	30,000	.00190	.00014	.00050	.00028	
31,000	31,000	.00204	.00014	.....	.....	
32,000	32,000	.00220	.00016	.....	.....	
33,000	33,000	.00241	.00021	.....	.....	
34,000	34,000	.00260	.00019	.....	.....	
35,000	35,000	.00296	.00036	.00130	.00080	
36,000	36,000	.00321	.00025	.....	.....	
37,000	37,000	.00348	.00027	.....	.....	
38,000	38,000	.00380	.00032	.....	.....	
39,000	39,000	.00422	.00042	.....	.....	
40,000	40,000	.00478	.00056	.00280	.00150	
51,520	51,520	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 868,

Marks,  $12 M R_{25} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch. .

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	-----	-----	
3,000	3,000	.00010	.00006	-----	-----	
4,000	4,000	.00014	.00004	-----	-----	
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00024	.00004	-----	-----	
7,000	7,000	.00028	.00004	-----	-----	
8,000	8,000	.00034	.00006	-----	-----	
9,900	9,000	.00038	.00004	-----	-----	
10,000	10,000	.00044	.00006	.00004	.00002	
11,000	11,000	.00048	.00004	-----	-----	
12,000	12,000	.00054	.00006	-----	-----	
13,000	13,000	.00058	.00004	-----	-----	
14,000	14,000	.00064	.00006	-----	-----	
15,000	15,000	.00070	.00006	.00006	.00002	
16,000	16,000	.00076	.00006	-----	-----	
17,000	17,000	.00082	.00006	-----	-----	
18,000	18,000	.00088	.00006	-----	-----	
19,000	19,000	.00094	.00006	-----	-----	
20,000	20,000	.00100	.00006	.00012	.00006	
21,000	21,000	.00104	.00004	-----	-----	
22,000	22,000	.00110	.00006	-----	-----	
23,000	23,000	.00118	.00008	-----	-----	
24,000	24,000	.00124	.00006	-----	-----	
25,000	25,000	.00132	.00008	.00022	.00010	
26,000	26,000	.00142	.00010	-----	-----	
27,000	27,000	.00150	.00008	-----	-----	
28,000	28,000	.00160	.00010	-----	-----	
29,000	29,000	.00174	.00014	-----	-----	
30,000	30,000	.00188	.00014	.00048	.00026	
31,000	31,000	.00204	.00016	-----	-----	
32,000	32,000	.00218	.00014	-----	-----	
33,000	33,000	.00234	.00016	-----	-----	
34,000	34,000	.00254	.00020	-----	-----	
35,000	35,000	.00388	.00034	.00124	.00076	
36,000	36,000	.00314	.00026	-----	-----	
37,000	37,000	.00330	.00016	-----	-----	
38,000	38,000	.00376	.00046	-----	-----	
39,000	39,000	.00418	.00042	-----	-----	
40,000	40,000	.00454	.00036	.00204	.00140	
60,650	60,650	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 26.

No. 4296.

Marks, 12 M R<sub>26</sub> T R<sub>1</sub>  
M T<sub>2</sub>

Length of stem, 23".

Diameter, 1".126.

Sectional area, .99 square inch.

Gauged length, 20".

Applied load.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
990	1,000	0.	0.	0.	0.	
1,980	2,000	.000050	.000050	.....	.....	
2,970	3,000	.000105	.000055	.....	.....	
3,960	4,000	.000155	.000050	.....	.....	
4,950	5,000	.000205	.000050	.000005	.000005	
5,940	6,000	.000260	.000055	.....	.....	
6,930	7,000	.000320	.000060	.....	.....	
7,920	8,000	.000380	.000060	.....	.....	
8,910	9,000	.000440	.000060	.....	.....	
9,900	10,000	.000505	.000065	.000045	.000040	
10,890	11,000	.000570	.000065	.....	.....	
11,880	12,000	.000645	.000075	.000075	.000030	
12,870	13,000	.000715	.000070	.....	.....	
13,860	14,000	.000805	.000090	.000115	.000040	
14,850	15,000	.000895	.000090	.....	.....	
15,840	16,000	.000995	.000100	.000190	.000075	
16,830	17,000	.001115	.000120	.....	.....	
17,820	18,000	.001255	.000140	.000310	.000120	
18,810	19,000	.001400	.000145	.....	.....	
19,800	20,000	.001585	.000185	.000500	.000190	Tensile strength.
20,680	20,890	.....	.....	.....	.....	

Fractured at middle of stem.

Appearance, granular, coarse dark-colored spangles.

## TENACITY SPECIMENS.

General marks, 12 M R<sub>26</sub> T R<sub>1</sub>.

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4504	M T <sub>2</sub> I	1.129	1.00	29,520	29,520	7.2962	14.05
4505	M T <sub>4</sub> O	1.129	1.00	28,040	28,040	7.3054	14.12
4506	M T <sub>2</sub> M	1.129	1.00	29,050	29,050	7.3063	14.76
4507	M T <sub>2</sub> O	1.129	1.00	31,530	31,530	7.2995	13.72

No. 877.

Marks,  $^{12} M R_{26} T R_1$   
 $^{M T_1}$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00013	.00005	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00023	.00005	.....	.....	
7,000	7,000	.00028	.00005	.....	.....	
8,000	8,000	.00033	.00005	.....	.....	
9,000	9,000	.00039	.00006	.....	.....	
10,000	10,000	.00044	.00005	.00002	.00002	
11,000	11,000	.00049	.00005	.....	.....	
12,000	12,000	.00055	.00006	.....	.....	
13,000	13,000	.00061	.00006	.....	.....	
14,000	14,000	.00068	.00007	.....	.....	
15,000	15,000	.00073	.00005	.00007	.00005	
16,000	16,000	.00080	.00007	.....	.....	
17,000	17,000	.00087	.00007	.....	.....	
18,000	18,000	.00093	.00006	.....	.....	
19,000	19,000	.00101	.00008	.....	.....	
20,000	20,000	.00108	.00007	.00012	.00005	
21,000	21,000	.00116	.00008	.....	.....	
22,000	22,000	.00122	.00006	.....	.....	
23,000	23,000	.00131	.00009	.....	.....	
24,000	24,000	.00140	.00009	.....	.....	
25,000	25,000	.00151	.00011	.00032	.00020	
26,000	26,000	.00165	.00014	.....	.....	
27,000	27,000	.00180	.00015	.....	.....	
28,000	28,000	.00192	.00012	.....	.....	
29,000	29,000	.00208	.00016	.....	.....	
30,000	30,000	.00231	.00023	.00083	.00051	
31,000	31,000	.00258	.00027	.....	.....	
32,000	32,000	.00287	.00029	.....	.....	
33,000	33,000	.00318	.00031	.....	.....	
34,000	34,000	.00351	.00033	.....	.....	
35,000	35,000	.00403	.00052	.00223	.00140	
36,000	36,000	.00447	.00044	.....	.....	
37,000	37,000	.00487	.00040	.....	.....	
38,000	38,000	.00544	.00057	.....	.....	
39,000	39,000	.00588	.00044	.....	.....	
40,000	40,000	.00662	.00074	.00452	.00229	Ultimate strength.
51,100	51,100	.....	.....	.....	.....	

Failed by triple flexure.

No. 4297.

Marks, 12 M R<sub>25</sub> T R<sub>2</sub>  
B T<sub>1</sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000105	.000055	-----	-----	
4,000	4,000	.000155	.000050	-----	-----	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000270	.000060	-----	-----	
7,000	7,000	.000340	.000070	-----	-----	
8,000	8,000	.000395	.000055	-----	-----	
9,000	9,000	.000460	.000065	-----	-----	
10,000	10,000	.000530	.000070	.000040	.000035	
11,000	11,000	.000600	.000070	-----	-----	
12,000	12,000	.000680	.000080	.000070	.000030	
13,000	13,000	.000760	.000080	-----	-----	
14,000	14,000	.000845	.000085	.000110	.000040	
15,000	15,000	.000935	.000090	-----	-----	
16,000	16,000	.001045	.000110	.000170	.000060	
17,000	17,000	.001165	.000120	-----	-----	
18,000	18,000	.001295	.000130	.000290	.000120	
19,000	19,000	.001450	.000155	-----	-----	
20,000	20,000	.001630	.000180	.000455	.000165	
21,000	21,000	.001840	.000210	-----	-----	
22,000	22,000	.002105	.000265	.000745	.000290	
23,000	23,000	.002415	.000310	-----	-----	
24,000	24,000	.002800	.000385	.001255	.000510	Tensile strength.
25,000	25,000	.003290	.000490	.001650	.000395	
27,980	27,980	-----	-----	-----	-----	

Fractured 6".7 from neck.

Appearance, uniform granular.

H, Ex. 165—21

No. 4298.

Marks,  $12\text{ M R}_{26}\text{ T R}_2$   
B T<sub>11</sub>

Length of stem, 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00011	.00005	.....	.....	
5,000	5,000	.00022	.00005	.00001	.00001	
6,000	6,000	.00028	.00006	.....	.....	
7,000	7,000	.00033	.00005	.....	.....	
8,000	8,000	.00039	.00006	.....	.....	
9,000	9,000	.00047	.00008	.....	.....	
10,000	10,000	.00053	.00006	.00006	.00005	
11,000	11,000	.00060	.00007	.....	.....	
12,000	12,000	.00068	.00008	.00008	.00002	
13,000	13,000	.00077	.00009	.....	.....	
14,000	14,000	.00085	.00008	.00011	.00003	
15,000	15,000	.00093	.00008	.....	.....	
16,000	16,000	.00105	.00012	.00017	.00006	
17,000	17,000	.00115	.00010	.....	.....	
18,000	18,000	.00128	.00013	.00028	.00011	
19,000	19,000	.00143	.00015	.....	.....	
20,000	20,000	.00160	.00017	.00043	.00015	
21,000	21,000	.00180	.00020	.....	.....	Tensile strength.
22,000	22,000	.00202	.00022	.00071	.00028	
23,000	23,000	.00235	.00033	.....	.....	
24,000	24,000	.00270	.00035	.00118	.00047	
25,000	25,000	.00318	.00048	.00153	.00035	
28,270	28,270	.....	.....	.....	.....	

Fractured 6" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12\text{ M R}_{26}\text{ T R}_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4508	B T <sub>3</sub> I	1.129	1.00	29,810	29,810	.....	.....
4509	B T <sub>4</sub> O	1.129	1.00	33,400	33,400	7.3041	14.98
4510	B T <sub>5</sub> M	1.129	1.00	30,380	30,380	.....	.....
4511	B L <sub>6</sub> I	1.129	1.00	30,650	30,650	7.3067	14.76
4512	B L <sub>7</sub> O	1.129	1.00	29,970	29,970	7.3058	15.20
4513	B L <sub>8</sub> M	1.129	1.00	31,260	31,260	7.3082	15.13



No. 878.

Marks, <sup>12 M R<sub>2</sub> T R<sub>2</sub></sup>  
B T<sub>2</sub>

Length, 12''.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Gauged length, 10''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	-----	-----	
3,000	3,000	.00010	.00005	-----	-----	
4,000	4,000	.00015	.00005	-----	-----	
5,000	5,000	.00020	.00005	0.	-----	
6,000	6,000	.00025	.00005	-----	-----	
7,000	7,000	.00030	.00005	-----	-----	
8,000	8,000	.00037	.00007	-----	-----	
9,000	9,000	.00042	.00005	-----	-----	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00054	.00006	-----	-----	
12,000	12,000	.00060	.00006	-----	-----	
13,000	13,000	.00067	.00007	-----	-----	
14,000	14,000	.00072	.00005	-----	-----	
15,000	15,000	.00079	.00007	.00009	.00007	
16,000	16,000	.00085	.00006	-----	-----	
17,000	17,000	.00091	.00006	-----	-----	
18,000	18,000	.00099	.00008	-----	-----	
19,000	19,000	.00107	.00008	-----	-----	
20,000	20,000	.00113	.00006	.00018	.00009	
21,000	21,000	.00121	.00008	-----	-----	
22,000	22,000	.00130	.00009	-----	-----	
23,000	23,000	.00138	.00008	-----	-----	
24,000	24,000	.00149	.00011	-----	-----	
25,000	25,000	.00159	.00010	.00033	.00015	
26,000	26,000	.00170	.00011	-----	-----	
27,000	27,000	.00180	.00010	-----	-----	
28,000	28,000	.00194	.00014	-----	-----	
29,000	29,000	.00210	.00016	-----	-----	
30,000	30,000	.00238	.00028	.00081	.00048	
31,000	31,000	.00258	.00020	-----	-----	
32,000	32,000	.00275	.00017	-----	-----	
33,000	33,000	.00298	.00023	-----	-----	
34,000	34,000	.00333	.00035	-----	-----	
35,000	35,000	.00368	.00035	.00184	.00103	
36,000	36,000	.00410	.00042	-----	-----	
37,000	37,000	.00440	.00030	-----	-----	
38,000	38,000	.00490	.00050	-----	-----	
39,000	39,000	.00540	.00050	-----	-----	
40,000	40,000	.00601	.00061	.00388	.00204	
53,050	53,050	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

No. 879.

Marks,  $12 M R_{26} T R_2$ Length,  $9' 43''$ .Diameter,  $1' 129''$ .

Sectional area, 1 square inch.

Gauged length,  $5' 1''$ .

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00040	.00004	.....	.....	
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00052	.00006	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00064	.00006	.....	.....	
14,000	14,000	.00070	.00006	.....	.....	
15,000	15,000	.00076	.00006	.00006	.00004	
16,000	16,000	.00082	.00006	.....	.....	
17,000	17,000	.00090	.00008	.....	.....	
18,000	18,000	.00096	.00006	.....	.....	
19,000	19,000	.00104	.00008	.....	.....	
20,000	20,000	.00110	.00006	.00014	.00008	
21,000	21,000	.00118	.00008	.....	.....	
22,000	22,000	.00124	.00006	.....	.....	
23,000	23,000	.00134	.00010	.....	.....	
24,000	24,000	.00144	.00010	.....	.....	
25,000	25,000	.00154	.00010	.00030	.00016	
26,000	26,000	.00164	.00010	.....	.....	
27,000	27,000	.00176	.00012	.....	.....	
28,000	28,000	.00190	.00014	.....	.....	
29,000	29,000	.00206	.00016	.....	.....	
30,000	30,000	.00226	.00020	.00076	.00046	
31,000	31,000	.00246	.00020	.....	.....	
32,000	32,000	.00266	.00020	.....	.....	
33,000	33,000	.00296	.00030	.....	.....	
34,000	34,000	.00334	.00038	.....	.....	
35,000	35,000	.00378	.00044	.00194	.00118	
36,000	36,000	.00416	.00038	.....	.....	
37,000	37,000	.00444	.00028	.....	.....	
38,000	38,000	.00512	.00068	.....	.....	
39,000	39,000	.00554	.00042	.....	.....	
40,000	40,000	.00604	.00050	.00390	.00196	
63,680	63,680	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 27.

No. 4299.

Marks,  $12 M R_{27} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000170	.000065	.....	.....	
5,000	5,000	.000230	.000060	.000030	.000030	
6,000	6,000	.000285	.000055	.....	.....	
7,000	7,000	.000340	.000055	.....	.....	
8,000	8,000	.000405	.000065	.....	.....	
9,000	9,000	.000460	.000055	.....	.....	
10,000	10,000	.000515	.000055	.000055	.000025	
11,000	11,000	.000590	.000075	.....	.....	
12,000	12,000	.000655	.000065	.000085	.000030	
13,000	13,000	.000735	.000080	.....	.....	
14,000	14,000	.000800	.000065	.000110	.000025	
15,000	15,000	.000885	.000085	.....	.....	
16,000	16,000	.000970	.000085	.000155	.000045	
17,000	17,000	.001070	.000100	.....	.....	
18,000	18,000	.001185	.000115	.000240	.000085	
19,000	19,000	.001305	.000120	.....	.....	
20,000	20,000	.001445	.000140	.000360	.000120	
21,000	21,000	.001600	.000155	.....	.....	
22,000	22,000	.001840	.000240	.000600	.000240	
23,000	23,000	.002060	.000220	.....	.....	
24,000	24,000	.002400	.000340	.000990	.000390	
25,000	25,000	.002860	.000460	.001360	.000370	
26,940	26,940	.....	.....	.....	.....	Tensile strength.

Fractured  $2\frac{1}{4}$ " from neck.

Appearance, granular, in part dark mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{27} T R_1$ 

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4524	$M T_1 I$	1.129	1.00	30,260	30,260	7.2994	14.33
4525	$M T_1 O$	1.129	1.00	29,980	29,980	7.2936	15.05
4526	$M T_1 M$	1.129	1.00	29,010	29,010	7.3015	15.20
4527	$M T_2 O$	1.129	1.00	31,170	31,170	7.2972	14.40

No. 885.

Marks,  $12 M R_2 T R_1$ Length,  $12''$ .Diameter,  $1''$ .129.

Sectional area, 1 square inch.

Gauged length,  $10''$ .

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	-----	-----	
3,000	3,000	.00010	.00005	-----	-----	
4,000	4,000	.00015	.00005	-----	-----	
5,000	5,000	.00020	.00005	0.	-----	
6,000	6,000	.00025	.00005	-----	-----	
7,000	7,000	.00030	.00005	-----	-----	
8,000	8,000	.00035	.00005	-----	-----	
9,000	9,000	.00040	.00005	-----	-----	
10,000	10,000	.00045	.00005	.00002	.00002	
11,000	11,000	.00050	.00005	-----	-----	
12,000	12,000	.00057	.00007	-----	-----	
13,000	13,000	.00062	.00005	-----	-----	
14,000	14,000	.00068	.00006	-----	-----	
15,000	15,000	.00072	.00004	.00007	.00005	
16,000	16,000	.00079	.00007	-----	-----	
17,000	17,000	.00084	.00005	-----	-----	
18,000	18,000	.00090	.00006	-----	-----	
19,000	19,000	.00098	.00008	-----	-----	
20,000	20,000	.00104	.00006	.00011	.00004	
21,000	21,000	.00111	.00007	-----	-----	
22,000	22,000	.00118	.00007	-----	-----	
23,000	23,000	.00125	.00007	-----	-----	
24,000	24,000	.00132	.00007	-----	-----	
25,000	25,000	.00140	.00008	.00022	.00011	
26,000	26,000	.00152	.00012	-----	-----	
27,000	27,000	.00162	.00010	-----	-----	
28,000	28,000	.00174	.00012	-----	-----	
29,000	29,000	.00186	.00012	-----	-----	
30,000	30,000	.00203	.00017	.00058	.00036	
31,000	31,000	.00228	.00025	-----	-----	
32,000	32,000	.00243	.00015	-----	-----	
33,000	33,000	.00265	.00022	-----	-----	
34,000	34,000	.00293	.00028	-----	-----	
35,000	35,000	.00328	.00035	.00145	.00087	
36,000	36,000	.00371	.00043	-----	-----	
37,000	37,000	.00398	.00027	-----	-----	
38,000	38,000	.00448	.00050	-----	-----	
39,000	39,000	.00490	.00042	-----	-----	
40,000	40,000	.00550	.00060	.00350	.00205	
50,200	50,200	-----	-----	-----	-----	Ultimate strength.

Failed by triple flexure.

No. 4300.

Marks, <sup>12 M R<sub>27</sub> T R<sub>2</sub></sup>  
B T<sub>1</sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000155	.000055	.....	.....	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000270	.000060	.....	.....	
7,000	7,000	.000335	.000065	.....	.....	
8,000	8,000	.000395	.000060	.....	.....	
9,000	9,000	.000455	.000060	.....	.....	
10,000	10,000	.000525	.000070	.000040	.000035	
11,000	11,000	.000600	.000075	.....	.....	
12,000	12,000	.000675	.000075	.000060	.000020	
13,000	13,000	.000740	.000065	.....	.....	
14,000	14,000	.000830	.000090	.000100	.000040	
15,000	15,000	.000930	.000100	.....	.....	
16,000	16,000	.001015	.000085	.000155	.000055	
17,000	17,000	.001125	.000110	.....	.....	
18,000	18,000	.001250	.000125	.000240	.000085	
19,000	19,000	.001390	.000140	.....	.....	
20,000	20,000	.001555	.000165	.000395	.000155	
21,000	21,000	.001745	.000190	.....	.....	
22,000	22,000	.001980	.000235	.000645	.000250	
23,000	23,000	.002235	.000255	.....	.....	
24,000	24,000	.002590	.000355	.001080	.000435	
25,000	25,000	.003000	.000410	.001405	.000325	
27,400	27,400	.....	.....	.....	.....	Tensile strength.

Fractured  $5\frac{1}{4}$ " from neck.

Appearance, uniform granular.

No. 4301.

Marks,  $12 M R_{27} T R_2$   
 $B T_{11}$ 

Length of stem, 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00011	.00005	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00021	.00005	0.	.....	
6,000	6,000	.00027	.00006	.....	.....	
7,000	7,000	.00033	.00006	.....	.....	
8,000	8,000	.00039	.00006	.....	.....	
9,000	9,000	.00045	.00006	.....	.....	
10,000	10,000	.00050	.00005	.00002	.00002	
11,000	11,000	.00058	.00008	.....	.....	
12,000	12,000	.00066	.00008	.00006	.00004	
13,000	13,000	.00072	.00006	.....	.....	
14,000	14,000	.00080	.00008	.00009	.00003	
15,000	15,000	.00089	.00009	.....	.....	
16,000	16,000	.00099	.00010	.00015	.00006	
17,000	17,000	.00109	.00010	.....	.....	
18,000	18,000	.00121	.00012	.00021	.00006	
19,000	19,000	.00133	.00013	.....	.....	
20,000	20,000	.00148	.00013	.00036	.00015	
21,000	21,000	.00168	.00020	.....	.....	
22,000	22,000	.00187	.00019	.00059	.00023	
23,000	23,000	.00213	.00026	.....	.....	Tensile strength.
24,000	24,000	.00242	.00029	.00098	.00039	
25,000	25,000	.00287	.00045	.00131	.00033	
27,030	27,030	.....	.....	.....	.....	

Fractured 7".4 from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{27} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4528	B T <sub>2</sub> I	1.129	1.00	29,420	29,420	.....	.....
4529	B T <sub>4</sub> O	1.129	1.00	32,690	32,690	7.2988	15.05
4530	B T <sub>5</sub> M	1.129	1.00	30,070	30,070	.....	.....
4531	B L <sub>6</sub> I	1.129	1.00	29,960	29,960	7.3041	14.90
4532	B L <sub>7</sub> O	1.129	1.00	31,240	31,240	7.3045	14.83
4533	B L <sub>8</sub> M	1.129	1.00	31,500	31,500	7.3062	15.05

No. 886.

Marks,  $12 M R_{27} T R_2$   
 $B T_1$ 

Length, 12''.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00009	.00005	.....	.....	
4,000	4,000	.00014	.00005	.....	.....	
5,000	5,000	.00019	.00005	.00001	.00001	
6,000	6,000	.00024	.00005	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00047	.00005	.00002	.00001	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00065	.00007	.....	.....	
14,000	14,000	.00071	.00006	.....	.....	
15,000	15,000	.00077	.00006	.00008	.00006	
16,000	16,000	.00084	.00007	.....	.....	
17,000	17,000	.00091	.00007	.....	.....	
18,000	18,000	.00098	.00007	.....	.....	
19,000	19,000	.00104	.00006	.....	.....	
20,000	20,000	.00111	.00007	.00015	.00007	
21,000	21,000	.00120	.00009	.....	.....	
22,000	22,000	.00129	.00009	.....	.....	
23,000	23,000	.00137	.00008	.....	.....	
24,000	24,000	.00147	.00010	.....	.....	
25,000	25,000	.00156	.00009	.00031	.00016	
26,000	26,000	.00167	.00011	.....	.....	
27,000	27,000	.00179	.00012	.....	.....	
28,000	28,000	.00191	.00012	.....	.....	
29,000	29,000	.00207	.00016	.....	.....	
30,000	30,000	.00222	.00014	.00070	.00039	
31,000	31,000	.00241	.00019	.....	.....	
32,000	32,000	.00267	.00026	.....	.....	
33,000	33,000	.00295	.00028	.....	.....	
34,000	34,000	.00321	.00026	.....	.....	
35,000	35,000	.00354	.00033	.00170	.00100	
36,000	36,000	.00400	.00046	.....	.....	
37,000	37,000	.00438	.00038	.....	.....	
38,000	38,000	.00482	.00044	.....	.....	
39,000	39,000	.00531	.00049	.....	.....	
40,000	40,000	.00581	.00050	.00371	.00201	
50,420	50,420	.....	.....	.....	.....	Ultimate strength.

. Failed by triple flexure.

## No. 887.

Marks,  $^{12}M R_{27} T R_2$ Length,  $8'' .31$ .Diameter,  $1'' .129$ .

Sectional area, 1 square inch.

Gauged length,  $5''$ .

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00010	.....	.....	
4,000	4,000	.00016	.00016	.....	.....	
5,000	5,000	.00020	.00020	.00002	.00002	
6,000	6,000	.00026	.00026	.....	.....	
7,000	7,000	.00030	.00030	.....	.....	
8,000	8,000	.00036	.00036	.....	.....	
9,000	9,000	.00044	.00044	.....	.....	
10,000	10,000	.00048	.00048	.00004	.00002	
11,000	11,000	.00054	.00054	.....	.....	
12,000	12,000	.00060	.00060	.....	.....	
13,000	13,000	.00064	.00064	.....	.....	
14,000	14,000	.00070	.00066	.....	.....	
15,000	15,000	.00076	.00066	.00010	.00006	
16,000	16,000	.00082	.00066	.....	.....	
17,000	17,000	.00090	.00068	.....	.....	
18,000	18,000	.00096	.00066	.....	.....	
19,000	19,000	.00102	.00068	.....	.....	
20,000	20,000	.00108	.00066	.00016	.00006	
21,000	21,000	.00116	.00068	.....	.....	
22,000	22,000	.00122	.00068	.....	.....	
23,000	23,000	.00130	.00068	.....	.....	
24,000	24,000	.00140	.00070	.....	.....	
25,000	25,000	.00156	.00070	.00028	.00012	
26,000	26,000	.00162	.00072	.....	.....	
27,000	27,000	.00172	.00070	.....	.....	
28,000	28,000	.00186	.00074	.....	.....	
29,000	29,000	.00200	.00074	.....	.....	
30,000	30,000	.00220	.00070	.00066	.00038	
31,000	31,000	.00240	.00070	.....	.....	
32,000	32,000	.00250	.00076	.....	.....	
33,000	33,000	.00284	.00078	.....	.....	
34,000	34,000	.00316	.00082	.....	.....	
35,000	35,000	.00350	.00084	.00168	.00102	
36,000	36,000	.00388	.00088	.....	.....	
37,000	37,000	.00424	.00096	.....	.....	
38,000	38,000	.00470	.00096	.....	.....	
39,000	39,000	.00530	.00096	.....	.....	
40,000	40,000	.00580	.00096	.00364	.00196	
70,040	70,040	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.



## CAST-IRON BODY, No. 28.

No. 4197. .

Marks, <sup>12 M R<sub>28</sub> M R<sub>1</sub></sup>  
<sub>M T<sub>2</sub></sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000305	.000055	-----	-----	
8,000	8,000	.000360	.000055	-----	-----	
9,000	9,000	.000410	.000050	-----	-----	
10,000	10,000	.000470	.000060	.000025	.000025	
11,000	11,000	.000535	.000065	-----	-----	
12,000	12,000	.000600	.000065	.000045	.000020	
13,000	13,000	.000670	.000070	-----	-----	
14,000	14,000	.000740	.000070	.000065	.000020	
15,000	15,000	.000815	.000075	-----	-----	
16,000	16,000	.000905	.000090	.000110	.000045	
17,000	17,000	.000990	.000085	-----	-----	
18,000	18,000	.001090	.000100	.000175	.000065	
19,000	19,000	.001200	.000110	-----	-----	
20,000	20,000	.001325	.000125	.000275	.000100	
21,000	21,000	.001475	.000150	-----	-----	Tensile strength.
22,000	22,000	.001655	.000180	.000460	.000185	
23,000	23,000	.001880	.000225	-----	-----	
24,000	24,000	.002165	.000285	.000790	.000330	
25,000	25,000	.002490	.000325	.001055	.000265	
25,120	25,120	-----	-----	-----	-----	

Fractured at middle of stem.

Appearance, granular; stellar spots.

## TENACITY SPECIMENS.

General marks, 12 M R<sub>28</sub> T R<sub>1</sub>.

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4514	M T <sub>2</sub> I	1.129	1.00	29,890	29,890	7.3076	14.54
4515	M T <sub>2</sub> O	1.129	1.00	28,440	29,440	7.3133	14.69
4516	M T <sub>2</sub> M	1.129	1.00	29,970	29,970	7.3150	15.51
4517	M T <sub>2</sub> O	1.129	1.00	32,460	32,460	7.3133	14.69

No. 882.

Marks,  $^{12} M R_2^8 T R^1$   
 $M T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00011	.00005	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00021	.00005	0.	.....	
6,000	6,000	.00028	.00005	.....	.....	
7,000	7,000	.00031	.00005	.....	.....	
8,000	8,000	.00036	.00005	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00047	.00006	.00002	.00002	
11,000	11,000	.00053	.00006	.....	.....	
12,000	12,000	.00058	.00005	.....	.....	
13,000	13,000	.00063	.00003	.....	.....	
14,000	14,000	.00069	.00006	.....	.....	
15,000	15,000	.00076	.00007	.00007	.00005	
16,000	16,000	.00081	.00005	.....	.....	
17,000	17,000	.00087	.00006	.....	.....	
18,000	18,000	.00093	.00006	.....	.....	
19,000	19,000	.00099	.00006	.....	.....	
20,000	20,000	.00107	.00008	.00012	.00005	
21,000	21,000	.00115	.00008	.....	.....	
22,000	22,000	.00122	.00007	.....	.....	
23,000	23,000	.00129	.00007	.....	.....	
24,000	24,000	.00137	.00008	.....	.....	
25,000	25,000	.00147	.00010	.00025	.00013	
26,000	26,000	.00157	.00010	.....	.....	
27,000	27,000	.00167	.00010	.....	.....	
28,000	28,000	.00178	.00011	.....	.....	
29,000	29,000	.00191	.00013	.....	.....	
30,000	30,000	.00209	.00018	.00061	.00036	
31,000	31,000	.00230	.00021	.....	.....	
32,000	32,000	.00248	.00018	.....	.....	
33,000	33,000	.00270	.00022	.....	.....	
34,000	34,000	.00287	.00017	.....	.....	
35,000	35,000	.00347	.00060	.00174	.00113	
36,000	36,000	.00388	.00036	.....	.....	
37,000	37,000	.00411	.00028	.....	.....	
38,000	38,000	.00462	.00051	.....	.....	
39,000	39,000	.00508	.00046	.....	.....	
40,000	40,000	.00561	.00053	.00355	.00185	Ultimate strength.
51,960	51,960	.....	.....	.....	.....	

Failed by triple flexure.

No. 4198.

Marks, <sup>12 M R<sub>22</sub> T R<sub>2</sub></sup>  
<sub>B T<sub>1</sub></sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000160	.000060	.....	.....	
5,000	5,000	.000220	.000080	0.	.....	
6,000	6,000	.000280	.000080	.....	.....	
7,000	7,000	.000335	.000055	.....	.....	
8,000	8,000	.000395	.000060	.....	.....	
9,000	9,000	.000450	.000055	.....	.....	
10,000	10,000	.000525	.000075	.000035	.000035	
11,000	11,000	.000585	.000060	.....	.....	
12,000	12,000	.000660	.000075	.000060	.000025	
13,000	13,000	.000740	.000080	.....	.....	
14,000	14,000	.000810	.000070	.000090	.000030	
15,000	15,000	.000900	.000090	.....	.....	
16,000	16,000	.000995	.000095	.000145	.000055	
17,000	17,000	.001095	.000100	.....	.....	
18,000	18,000	.001220	.000125	.000230	.000085	
19,000	19,000	.001350	.000130	.....	.....	
20,000	20,000	.001500	.000150	.000360	.000130	
21,000	21,000	.001700	.000200	.....	.....	Ultimate strength.
22,000	22,000	.001910	.000210	.000600	.000240	
23,000	23,000	.002195	.000285	.....	.....	
24,000	24,000	.002520	.000326	.001030	.000430	
25,000	25,000	.002865	.000345	.001310	.000280	
26,170	26,170	.....	.....	.....	.....	

Fractured 5" from neck.

Appearance, uniform granular.

No. 4199.

Marks,  $12 M R_{28} T R_2$   
                     $B T_{11}$ 

Length of stem, 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00011	.00005	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00021	.00005	0.	.....	
6,000	6,000	.00026	.00005	.....	.....	
7,000	7,000	.00032	.00006	.....	.....	
8,000	8,000	.00038	.00006	.....	.....	
9,000	9,000	.00044	.00006	.....	.....	
10,000	10,000	.00050	.00006	.00003	.00003	
11,000	11,000	.00057	.00007	.....	.....	
12,000	12,000	.00064	.00007	.00006	.00003	
13,000	13,000	.00072	.00008	.....	.....	
14,000	14,000	.00079	.00007	.00008	.00002	
15,000	15,000	.00088	.00009	.....	.....	
16,000	16,000	.00097	.00009	.00022	.00004	
17,000	17,000	.00107	.00010	.....	.....	
18,000	18,000	.00117	.00010	.00019	.00007	
19,000	19,000	.00129	.00012	.....	.....	
20,000	20,000	.00142	.00013	.00032	.00013	
21,000	21,000	.00158	.00016	.....	.....	
22,000	22,000	.00177	.00019	.00052	.00020	
23,000	23,000	.00203	.00026	.....	.....	Tensile strength.
24,000	24,000	.00231	.00028	.00088	.00036	
25,000	25,000	.00265	.00034	.00113	.00025	
28,180	28,180	.....	.....	.....	.....	

Fractured  $\frac{1}{2}$ " from middle of stem.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $12 M R_{28} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4518	$B T_2 I$	1.129	1.00	30,680	30,680	.....	.....
4519	$B T_4 O$	1.129	1.00	32,050	32,050	7.3132	15.20
4520	$B T_2 M$	1.129	1.00	30,040	30,040	.....	.....
4521	$B L_6 I$	1.129	1.00	30,520	30,520	7.3137	15.13
4522	$B L_2 O$	1.129	1.00	31,640	31,640	7.3168	14.98
4523	$B L_8 M$	1.129	1.00	31,970	31,970	7.3157	14.47

No. 883.

Marks,  $12 M R_2 T R_2$   
 $B T_2$ 

Length, 12''.

Diameter, 1''.129.

Sectional area, 1 square inch.

Gauged length, 10''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00025	.00005	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00035	.00005	.....	.....	
9,000	9,000	.00040	.00005	.....	.....	
10,000	10,000	.00047	.00007	.00002	.00002	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00059	.00007	.....	.....	
13,000	13,000	.00065	.00006	.....	.....	
14,000	14,000	.00071	.00006	.....	.....	
15,000	15,000	.00077	.00006	.00007	.00005	
16,000	16,000	.00082	.00005	.....	.....	
17,000	17,000	.00089	.00007	.....	.....	
18,000	18,000	.00098	.00009	.....	.....	
19,000	19,000	.00104	.00006	.....	.....	
20,000	20,000	.00111	.00007	.00013	.00006	
21,000	21,000	.00118	.00007	.....	.....	
22,000	22,000	.00128	.00010	.....	.....	
23,000	23,000	.00135	.00007	.....	.....	
24,000	24,000	.00143	.00008	.....	.....	
25,000	25,000	.00152	.00009	.00029	.00016	
26,000	26,000	.00162	.00010	.....	.....	
27,000	27,000	.00174	.00012	.....	.....	
28,000	27,000	.00186	.00012	.....	.....	
29,000	29,000	.00201	.00015	.....	.....	
30,000	30,000	.00221	.00020	.00069	.00040	
31,000	31,000	.00240	.00019	.....	.....	
32,000	32,000	.00255	.00015	.....	.....	
33,000	33,000	.00283	.00028	.....	.....	
34,000	34,000	.00312	.00029	.....	.....	
35,000	35,000	.00350	.00038	.00170	.00101	
36,000	36,000	.00390	.00040	.....	.....	
37,000	37,000	.00420	.00030	.....	.....	
38,000	38,000	.00460	.00040	.....	.....	
39,000	39,000	.00517	.00057	.....	.....	
40,000	40,000	.00578	.00061	.00364	.00194	
52,100	52,100	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 884.

Marks,  $12 M R_{25} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".29.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	0.	.....	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00074	.00006	.00006	.00006	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00092	.00006	.....	.....	
19,000	19,000	.00100	.00008	.....	.....	
20,000	20,000	.00106	.00006	.00010	.00004	
21,000	21,000	.00114	.00008	.....	.....	
22,000	22,000	.00122	.00008	.....	.....	
23,000	23,000	.00130	.00008	.....	.....	
24,000	24,000	.00138	.00008	.....	.....	
25,000	25,000	.00148	.00010	.00026	.00016	
26,000	26,000	.00160	.00012	.....	.....	
27,000	27,000	.00170	.00010	.....	.....	
28,000	28,000	.00184	.00014	.....	.....	
29,000	29,000	.00198	.00014	.....	.....	
30,000	30,000	.00218	.00020	.00068	.00042	
31,000	31,000	.00238	.00020	.....	.....	
32,000	32,000	.00260	.00022	.....	.....	
33,000	33,000	.00280	.00020	.....	.....	
34,000	34,000	.00314	.00034	.....	.....	
35,000	35,000	.00348	.00034	.00108	.00100	
36,000	36,000	.00386	.00038	.....	.....	
37,000	37,000	.00420	.00034	.....	.....	
38,000	38,000	.00470	.00050	.....	.....	
39,000	39,000	.00512	.00042	.....	.....	
40,000	40,000	.00566	.00054	.00356	.00188	
61,040	61,040	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 29.

No. 4159.

Marks,  $12 M R_{29} T R_1$   
 $M R_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000305	.000055	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000415	.000060	.....	.....	
10,000	10,000	.000475	.000060	.000025	.000025	
11,000	11,000	.000530	.000055	.....	.....	
12,000	12,000	.000600	.000070	.000040	.000015	
13,000	13,000	.000660	.000060	.....	.....	
14,000	14,000	.000730	.000070	.000075	.000035	
15,000	15,000	.000810	.000080	.....	.....	
16,000	16,000	.000885	.000075	.000115	.000040	
17,000	17,000	.000985	.000100	.....	.....	
18,000	18,000	.001085	.000100	.000180	.000065	
19,000	19,000	.001205	.000120	.....	.....	
20,000	20,000	.001320	.000115	.000305	.000125	
21,000	21,000	.001470	.000150	.....	.....	
22,000	22,000	.001660	.000190	.000505	.000200	
23,000	23,000	.001920	.000260	.....	.....	
24,000	24,000	.002170	.000250	.000860	.000355	
25,000	25,000	.002610	.000440	.001210	.000350	
27,510	27,510	.....	.....	.....	.....	Tensile strength.

Fractured 2" from the neck.

Appearance, granular mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{29} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4480	$M T_3 I$	1.129	1.00	31,540	31,540	7.3389	15.59
4481	$M T_4 O$	1.129	1.00	30,010	30,010	7.3327	14.98
44-2	$M T_5 M$	1.129	1.00	28,400	28,400	7.3349	15.51
4483	$M T_5 O$	1.129	1.00	32,720	32,720	7.3350	14.98

## No. 872.

Marks,  ${}^{12}M R_{20} T R_1$ Length,  $12''$ .Diameter,  $1''.129$ .

Sectional area, 1 square inch.

Gauged length,  $10''$ .

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004			
3,000	3,000	.00009	.00005			
4,000	4,000	.00013	.00004			
5,000	5,000	.00018	.00005	0.		
6,000	6,000	.00023	.00005			
7,000	7,000	.00028	.00005			
8,000	8,000	.00032	.00004			
9,000	9,000	.00037	.00005			
10,000	10,000	.00042	.00005	.00001	.00001	
11,000	11,000	.00048	.00006			
12,000	12,000	.00053	.00005			
13,000	13,000	.00058	.00005			
14,000	14,000	.00063	.00005			
15,000	15,000	.00069	.00006	.00003	.00003	
16,000	16,000	.00073	.00004			
17,000	17,000	.00079	.00006			
18,000	18,000	.00084	.00005			
19,000	19,000	.00091	.00007			
20,000	20,000	.00099	.00008	.00012	.00009	
21,000	21,000	.00105	.00006			
22,000	22,000	.00112	.00007			
23,000	23,000	.00120	.00008			
24,000	24,000	.00129	.00009			
25,000	25,000	.00139	.00010	.00025	.00013	
26,000	26,000	.00149	.00010			
27,000	27,000	.00160	.00011			
28,000	28,000	.00172	.00012			
29,000	29,000	.00189	.00017			
30,000	30,000	.00203	.00014	.00069	.00014	
31,000	31,000	.00232	.00029			
32,000	32,000	.00252	.00020			
33,000	33,000	.00278	.00026			
34,000	34,000	.00312	.00034			
35,000	35,000	.00363	.00051	.00193	.00124	
36,000	36,000	.00403	.00040			
37,000	37,000	.00442	.00039			
38,000	38,000	.00483	.00041			
39,000	39,000	.00534	.00051			
40,000	40,000	.00590	.00056	.00393	.00200	
51,450	51,450					Ultimate strength.

Failed by triple flexure.



No. 4157.

Marks,  $12 M R_{20} T R_2$   
B T<sub>1</sub>

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	-----	-----	
3,000	3,000	.000100	.000050	-----	-----	
4,000	4,000	.000150	.000050	-----	-----	
5,000	5,000	.000200	.000050	0.	-----	
6,000	6,000	.000250	.000050	-----	-----	
7,000	7,000	.000305	.000055	-----	-----	
8,000	8,000	.000355	.000050	-----	-----	
9,000	9,000	.000410	.000055	-----	-----	
10,000	10,000	.000485	.000075	.000020	.000020	
11,000	11,000	.000545	.000060	-----	-----	
12,000	12,000	.000600	.000055	.000040	.000020	
13,000	13,000	.000670	.000070	-----	-----	
14,000	14,000	.000740	.000070	.000065	.000025	
15,000	15,000	.000815	.000075	-----	-----	
16,000	16,000	.000900	.000085	.000105	.000040	
17,000	17,000	.000990	.000090	-----	-----	
18,000	18,000	.001099	.000100	.000160	.000055	
19,000	19,000	.001200	.000110	-----	-----	
20,000	20,000	.001320	.000120	.000260	.000100	
21,000	21,000	.001465	.000145	-----	-----	
22,000	22,000	.001635	.000170	.000440	.000180	
23,000	23,000	.001820	.000185	-----	-----	
24,000	24,000	.002055	.000235	.000740	.000300	
25,000	25,000	.002375	.000320	.000940	.000200	
26,700	26,700	-----	-----	-----	-----	Tensile strength.

Fractured at middle of stem.

Appearance, uniform granular.

No. 4158.

Marks, 12 M R<sub>29</sub> T R<sub>2</sub>B T<sub>11</sub>

Length of stem, 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00031	.00005	.....	.....	
8,000	8,000	.00036	.00005	.....	.....	
9,000	9,000	.00041	.00005	.....	.....	
10,000	10,000	.00048	.00007	.00002	.00002	
11,000	11,000	.00054	.00006	.....	.....	
12,000	12,000	.00060	.00006	.00006	.00004	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00073	.00007	.00007	.00001	
15,000	15,000	.00081	.00008	.....	.....	
16,000	16,000	.00089	.00008	.00011	.00004	
17,000	17,000	.00098	.00009	.....	.....	
18,000	18,000	.00107	.00009	.00018	.00007	
19,000	19,000	.00117	.00010	.....	.....	
20,000	20,000	.00130	.00013	.00028	.00010	
21,000	21,000	.00142	.00012	.....	.....	
22,000	22,000	.00159	.00017	.00044	.00016	
23,000	23,000	.00179	.00020	.....	.....	
24,000	24,000	.00201	.00022	.00071	.00027	
25,000	25,000	.00239	.00038	.00099	.00028	
25,640	25,640	.....	.....	.....	.....	Tensile strength.

Fractured 6" from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks, 12 M R<sub>29</sub> T R<sub>2</sub>.

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4474	B T <sub>3</sub> I	1.129	1.00	29,810	29,810	.....	.....
4475	B T <sub>3</sub> O	1.125	1.00	32,670	32,670	7.3319	15.75
4476	B T <sub>3</sub> M	1.129	1.00	30,650	30,650	.....	.....
4477	B L <sub>6</sub> I	1.129	1.00	32,290	32,290	7.3452	15.59
4478	B L <sub>7</sub> O	1.129	1.00	32,070	32,070	7.3427	16.73
4479	B L <sub>8</sub> M	1.129	1.00	32,020	32,020	7.3436	15.59

No. 870.

Marks,  $^{12} M R_{22} T R_2$   
 $B T_2$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Tensile load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00013	.00005	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00023	.00005	.....	.....	
7,000	7,000	.00029	.00006	.....	.....	
8,000	8,000	.00034	.00005	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00045	.00005	.00002	.00002	
11,000	11,000	.00050	.00005	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00073	.00005	.00007	.00005	
16,000	16,000	.00078	.00005	.....	.....	
17,000	17,000	.00083	.00005	.....	.....	
18,000	18,000	.00090	.00007	.....	.....	
19,000	19,000	.00097	.00007	.....	.....	
20,000	20,000	.00102	.00005	.00011	.00004	
21,000	21,000	.00110	.00008	.....	.....	
22,000	22,000	.00117	.00007	.....	.....	
23,000	23,000	.00124	.00007	.....	.....	
24,000	24,000	.00130	.00006	.....	.....	
25,000	25,000	.00139	.00009	.00024	.00013	
26,000	26,000	.00150	.00011	.....	.....	
27,000	27,000	.00161	.00011	.....	.....	
28,000	28,000	.00171	.00010	.....	.....	
29,000	29,000	.00184	.00013	.....	.....	
30,000	30,000	.00201	.00017	.00038	.00034	
31,000	31,000	.00221	.00020	.....	.....	
32,000	32,000	.00238	.00017	.....	.....	
33,000	33,000	.00260	.00022	.....	.....	
34,000	34,000	.00292	.00032	.....	.....	
35,000	35,000	.00326	.00034	.00157	.00099	
36,000	36,000	.00360	.00034	.....	.....	
37,000	37,000	.00395	.00035	.....	.....	
38,000	38,000	.00433	.00038	.....	.....	
39,000	39,000	.00480	.00047	.....	.....	
40,000	40,000	.00533	.00053	.00333	.00176	
53,060	53,060	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 871.

Marks,  $^{12}MR_{25} T R_2$   
 $B R_{10}$ 

Length, 10'.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5'.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	.00004	.00004	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00054	.00004	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00070	.00006	.00004	0.	
16,000	16,000	.00078	.00008	.....	.....	
17,000	17,000	.00082	.00004	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00094	.00006	.....	.....	
20,000	20,000	.00100	.00006	.00010	.00006	
21,000	21,000	.00108	.00008	.....	.....	
22,000	22,000	.00114	.00006	.....	.....	
23,000	23,000	.00122	.00008	.....	.....	
24,000	24,000	.00130	.00008	.....	.....	
25,000	25,000	.00138	.00008	.00024	.00014	
26,000	26,000	.00148	.00010	.....	.....	
27,000	27,000	.00158	.00010	.....	.....	
28,000	28,000	.00168	.00010	.....	.....	
29,000	29,000	.00182	.00014	.....	.....	
30,000	30,000	.00200	.00018	.00062	.00038	
31,000	31,000	.00226	.00026	.....	.....	
32,000	32,000	.00240	.00014	.....	.....	
33,000	33,000	.00264	.00024	.....	.....	
34,000	34,000	.00294	.00030	.....	.....	
35,000	35,000	.0038	.00044	.00168	.00106	
36,000	36,000	.00372	.00034	.....	.....	
37,000	37,000	.00404	.00032	.....	.....	
38,000	38,000	.00448	.00044	.....	.....	
39,000	39,000	.00500	.00052	.....	.....	
40,000	40,000	.00554	.00054	.00354	.00186	
62,500	62,500	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 30.

No. 4169.

Marks,  $12 M R_{30} T R_1$   
 $M T_2$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000305	.000055	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000415	.000063	.....	.....	
10,000	10,000	.000480	.000065	.000035	.000035	
11,000	11,000	.000540	.000060	.....	.....	
12,000	12,000	.000605	.000065	.000050	.000015	
13,000	13,000	.000675	.000070	.....	.....	
14,000	14,000	.000755	.000080	.000090	.000040	
15,000	15,000	.000835	.000080	.....	.....	
16,000	16,000	.000910	.000075	.000135	.000045	
17,000	17,000	.001010	.000100	.....	.....	
18,000	18,000	.001110	.000100	.000210	.000075	
19,000	19,000	.001220	.000110	.....	.....	
20,000	20,000	.001360	.000140	.000310	.000100	
21,000	21,000	.001540	.000180	.....	.....	
22,000	22,000	.001725	.000185	.000540	.000230	Tensile strength.
23,000	23,000	.001965	.000240	.....	.....	
23,980	23,980	.....	.....	.....	.....	

Fractured 10".75 from neck. Appearance granular; 50 per cent. of fractured surface contains dark-colored spangles.

## TENACITY SPECIMENS.

General marks,  $12 M R_{30} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4484	$M T_3 I$	1.129	1.00	29,630	29,630	7.3156	14.26
4485	$M T_4 O$	1.129	1.00	29,470	29,470	7.3185	14.12
4486	$M T_5 M$	1.129	1.00	30,260	30,260	7.3250	14.76
4487	$M T_6 O$	1.129	1.00	31,940	31,940	7.3245	14.40

## No. 873.

Marks, <sup>12 M R<sub>30</sub> T R<sub>1</sub></sup>  
<sub>M T<sub>1</sub></sub>

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads-		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00009	.00005	.....	.....	
4,000	4,000	.00014	.00005	.....	.....	
5,000	5,000	.00019	.00005	0.	.....	
6,000	6,000	.00024	.00005	.....	.....	
7,000	7,000	.00029	.00005	.....	.....	
8,000	8,000	.00034	.00005	.....	.....	
9,000	9,000	.00039	.00005	.....	.....	
10,000	10,000	.00045	.00006	0.	.....	
11,000	11,000	.00049	.00004	.....	.....	
12,000	12,000	.00056	.00007	.....	.....	
13,000	13,000	.00060	.00004	.....	.....	
14,000	14,000	.00066	.00006	.....	.....	
15,000	15,000	.00071	.00005	.00003	.00006	
16,000	16,000	.00077	.00006	.....	.....	
17,000	17,000	.00085	.00008	.....	.....	
18,000	18,000	.00090	.00005	.....	.....	
19,000	19,000	.00097	.00007	.....	.....	
20,000	20,000	.00103	.00006	.00010	.00004	
21,000	21,000	.00110	.00007	.....	.....	Ultimate strength.
22,000	22,000	.00119	.00009	.....	.....	
23,000	23,000	.00126	.00007	.....	.....	
24,000	24,000	.00136	.00010	.....	.....	
25,000	25,000	.00145	.00009	.00028	.00018	
26,000	26,000	.00156	.00011	.....	.....	
27,000	27,000	.00166	.00010	.....	.....	
28,000	28,000	.00178	.00012	.....	.....	
29,000	29,000	.00195	.00017	.....	.....	
30,000	30,000	.00215	.00020	.00069	.00041	
31,000	31,000	.00240	.00025	.....	.....	
32,000	32,000	.00260	.00020	.....	.....	
33,000	33,000	.00288	.00028	.....	.....	
34,000	34,000	.00321	.00033	.....	.....	
35,000	35,000	.00355	.00034	.00183	.00114	
36,000	36,000	.00399	.00044	.....	.....	
37,000	37,000	.00450	.00051	.....	.....	
38,000	38,000	.00503	.00053	.....	.....	
39,000	39,000	.00552	.00049	.....	.....	
40,000	40,000	.00621	.00069	.00417	.00234	
50,780	50,780	.....	.....	.....	.....	

Failed by triple flexure.

No. 4167.

Marks,  $^{12}M R_{30} T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	0.	.....	
6,000	6,000	.000270	.000060	.....	.....	
7,000	7,000	.000330	.000060	.....	.....	
8,000	8,000	.000390	.000060	.....	.....	
9,000	9,000	.000450	.000060	.....	.....	
10,000	10,000	.000510	.000060	.000040	.000040	
11,000	11,000	.000585	.000075	.....	.....	
12,000	12,000	.000650	.000065	.000060	.000020	
13,000	13,000	.000735	.000045	.....	.....	
14,000	14,000	.000800	.000065	.000090	.000030	
15,000	15,000	.000890	.000090	.....	.....	
16,000	16,000	.000975	.000085	.000140	.000050	
17,000	17,000	.001065	.000090	.....	.....	
18,000	18,000	.001190	.000125	.000205	.000065	
19,000	19,000	.001310	.000120	.....	.....	
20,000	20,000	.001455	.000145	.000340	.000135	
21,000	21,000	.001630	.000175	.....	.....	
22,000	22,000	.001835	.000205	.000560	.000220	
23,000	23,000	.002085	.000250	.....	.....	
24,000	24,000	.002350	.000265	.000915	.000355	
25,000	25,000	.002775	.000425	.001235	.000320	
29,270	29,270	.....	.....	.....	.....	Tensile strength.

Fractured  $8\frac{1}{4}$ " from neck.

Appearance, uniform granular.

No. 4168.

Marks,  $12 M R_{30} T R_2$   
 $B T_{11}$ 

Length of stem 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00011	.00005	.....	.....	
4,000	4,000	.00016	.00005	.....	.....	
5,000	5,000	.00021	.00005	0.	.....	
6,000	6,000	.00028	.00007	.....	.....	
7,000	7,000	.00035	.00007	.....	.....	
8,000	8,000	.00040	.00005	.....	.....	
9,000	9,000	.00045	.00005	.....	.....	
10,000	10,000	.00050	.00005	.00005	.00005	
11,000	11,000	.00056	.00006	.....	.....	
12,000	12,000	.00064	.00008	.00007	.00002	
13,000	13,000	.00070	.00008	.....	.....	
14,000	14,000	.00079	.00009	.00009	.00002	
15,000	15,000	.00088	.00009	.....	.....	
16,000	16,000	.00098	.00010	.00014	.00005	
17,000	17,000	.00108	.00010	.....	.....	
18,000	18,000	.00120	.00012	.00022	.00008	
19,000	19,000	.00132	.00012	.....	.....	
20,000	20,000	.00147	.00015	.00037	.00015	
21,000	21,000	.00164	.00017	.....	.....	
22,000	22,000	.00182	.00018	.00057	.00020	
23,000	23,000	.00208	.00026	.....	.....	
24,000	24,000	.00240	.00032	.00098	.00041	Tensile strength.
25,000	25,000	.00280	.00040	.00127	.00029	
27,710	27,710	.....	.....	.....	.....	

Fractured 2" from neck.

Appearance, granular, with dark-colored spangles.

## TENACITY SPECIMENS.

General marks,  $12 M R_{30} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4488	B T <sub>3</sub> I	1.129	1.00	29,610	29,610	.....	.....
4489	B T <sub>4</sub> O	1.129	1.00	34,310	34,310	7.3350	15.13
4490	B T <sub>5</sub> M	1.129	1.00	30,300	30,300	.....	.....
4491	B L <sub>6</sub> I	1.129	1.00	29,820	29,820	7.3297	14.90
4492	B L <sub>7</sub> O	1.129	1.00	32,240	32,240	7.3277	15.28
4493	B L <sub>8</sub> M	1.129	1.00	32,980	32,980	7.3212	14.26



No. 874.

Marks,  ${}^{12}M R_{80} T R_2$   
 $B T_2$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00003	.00003	.....	.....	
3,000	3,000	.00009	.00006	.....	.....	
4,000	4,000	.00013	.00004	.....	.....	
5,000	5,000	.00019	.00008	.00001	.00001	
6,000	6,000	.00025	.00006	.....	.....	
7,000	7,000	.00030	.00005	.....	.....	
8,000	8,000	.00037	.00007	.....	.....	
9,000	9,000	.00042	.00005	.....	.....	
10,000	10,000	.00047	.00005	.00002	.00001	
11,000	11,000	.00052	.00005	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00063	.00005	.....	.....	
14,000	14,000	.00069	.00006	.....	.....	
15,000	15,000	.00076	.00007	.00007	.00005	
16,000	16,000	.00081	.00005	.....	.....	
17,000	17,000	.00088	.00007	.....	.....	
18,000	18,000	.00094	.00006	.....	.....	
19,000	19,000	.00101	.00007	.....	.....	
20,000	20,000	.00108	.00007	.00012	.00005	
21,000	21,000	.00115	.00007	.....	.....	
22,000	22,000	.00122	.00007	.....	.....	
23,000	23,000	.00129	.00007	.....	.....	
24,000	24,000	.00138	.00009	.....	.....	
25,000	25,000	.00149	.00011	.00028	.00016	
26,000	26,000	.00158	.00009	.....	.....	
27,000	27,000	.00168	.00010	.....	.....	
28,000	28,000	.00181	.00013	.....	.....	
29,000	29,000	.00194	.00013	.....	.....	
30,000	30,000	.00216	.00022	.00065	.00037	
31,000	31,000	.00233	.00017	.....	.....	
32,000	32,000	.00251	.00018	.....	.....	
33,000	33,000	.00274	.00023	.....	.....	
34,000	34,000	.00300	.00026	.....	.....	
35,000	35,000	.00345	.00045	.00168	.00103	
36,000	36,000	.00373	.00028	.....	.....	
37,000	37,000	.00402	.00029	.....	.....	
38,000	38,000	.00448	.00046	.....	.....	
39,000	39,000	.00501	.00053	.....	.....	
40,000	40,000	.00570	.00069	.00362	.00194	
52,700	52,700	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 875.

Marks,  $12 M R_{20} T R_2$   
 $B R_{10}$ 

Length, 10''.

Diameter, 1'' .129.

Sectional area, 1 square inch.

Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00010			
4,000	4,000	.00014	.00014			
5,000	5,000	.00018	.00018	.00002	.00002	
6,000	6,000	.00024	.00024			
7,000	7,000	.00030	.00030			
8,000	8,000	.00034	.00034			
9,000	9,000	.00038	.00038			
10,000	10,000	.00044	.00044	.00002	0.	
11,000	11,000	.00050	.00050			
12,000	12,000	.00056	.00056			
13,000	13,000	.00060	.00060			
14,000	14,000	.00066	.00066			
15,000	15,000	.00072	.00072	.00010	.00008	
16,000	16,000	.00078	.00078			
17,000	17,000	.00082	.00082			
18,000	18,000	.00090	.00090			
19,000	19,000	.00096	.00096			
20,000	20,000	.00102	.00102	.00012	.00002	
21,000	21,000	.00110	.00110			
22,000	22,000	.00116	.00116			
23,000	23,000	.00126	.00126			
24,000	24,000	.00132	.00132	.00016	.00014	
25,000	25,000	.00140	.00140	.00026		
26,000	26,000	.00150	.00150			
27,000	27,000	.00160	.00160			
28,000	28,000	.00172	.00172			
29,000	29,000	.00186	.00186			
30,000	30,000	.00202	.00202	.00060	.00034	
31,000	31,000	.00230	.00230			
32,000	32,000	.00248	.00248			
33,000	33,000	.00270	.00270			
34,000	34,000	.00302	.00302			
35,000	35,000	.00330	.00330	.00162	.00102	
36,000	36,000	.00380	.00380			
37,000	37,000	.00414	.00414			
38,000	38,000	.00458	.00458			
39,000	39,000	.00504	.00504			
40,000	40,000	.00552	.00552	.00350	.00188	
61,050	61,050					Ultimate strength.

Failed by triple flexure.

## CAST-IRON BODY, No. 31.

No. 4293.

Marks,  $12 M R_{31} T R_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000160	.000055	.....	.....	
5,000	5,000	.000210	.000050	.000010	.000010	
6,000	6,000	.000260	.000050	.....	.....	
7,000	7,000	.000320	.000060	.....	.....	
8,000	8,000	.000370	.000050	.....	.....	
9,000	9,000	.000430	.000060	.....	.....	
10,000	10,000	.000480	.000050	.000035	.000025	
11,000	11,000	.000545	.000065	.....	.....	
12,000	12,000	.000615	.000070	.000050	.000015	
13,000	13,000	.000675	.000060	.....	.....	
14,000	14,000	.000745	.000070	.000080	.000030	
15,000	15,000	.000815	.000070	.....	.....	
16,000	16,000	.000900	.000085	.000125	.000045	
17,000	17,000	.000985	.000085	.....	.....	
18,000	18,000	.001085	.000100	.000180	.000055	
19,000	19,000	.001190	.000105	.....	.....	
20,000	20,000	.001300	.000110	.000280	.000100	
21,000	21,000	.001450	.000150	.....	.....	
22,000	22,000	.001610	.000160	.000450	.000170	
23,000	23,000	.001825	.000215	.....	.....	
24,000	24,000	.002055	.000230	.000765	.000315	
25,000	25,000	.002410	.000355	.001020	.000455	
28,990	28,990	.....	.....	.....	.....	Tensile strength.

Fractured 1" from neck.

Appearance, granular, dark mottled.

## TENACITY SPECIMENS.

General marks,  $12 M R_{31} T R_1$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4494	$M T_3 I$	1.129	1.00	31,070	31,070	7.3366	14.83
4495	$M T_4 O$	1.129	1.00	30,250	30,250	7.3281	14.69
4496	$M T_5 M$	1.129	1.00	29,870	29,870	7.3326	15.28
4497	$M T_6 O$	1.129	1.00	33,450	33,450	7.3368	14.12

## No. 876.

Marks,  $^{12}M R_1 T R_1$   
 $M T_1$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00009	.00005	.....	.....	
4,000	4,000	.00013	.00004	.....	.....	
5,000	5,000	.00018	.00005	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00027	.00005	.....	.....	
8,000	8,000	.00032	.00005	.....	.....	
9,000	9,000	.00038	.00006	.....	.....	
10,000	10,000	.00042	.00004	.00001	.00001	
11,000	11,000	.00045	.00006	.....	.....	
12,000	12,000	.00053	.00005	.....	.....	
13,000	13,000	.00058	.00005	.....	.....	
14,000	14,000	.00063	.00005	.....	.....	
15,000	15,000	.00068	.00005	.00004	.00003	
16,000	16,000	.00073	.00005	.....	.....	
17,000	17,000	.00080	.00007	.....	.....	
18,000	18,000	.00088	.00008	.....	.....	
19,000	19,000	.00094	.00006	.....	.....	
20,000	20,000	.00099	.00005	.00010	.00006	
21,000	21,000	.00105	.00006	.....	.....	
22,000	22,000	.00122	.00007	.....	.....	
23,000	23,000	.00119	.00007	.....	.....	
24,000	24,000	.00127	.00008	.....	.....	
25,000	25,000	.00138	.00011	.00021	.00011	
26,000	26,000	.00148	.00010	.....	.....	
27,000	27,000	.00158	.00010	.....	.....	
28,000	28,000	.00169	.00011	.....	.....	
29,000	29,000	.00182	.00013	.....	.....	
30,000	30,000	.00199	.00017	.00058	.00037	
31,000	31,000	.00218	.00019	.....	.....	
32,000	32,000	.00242	.00024	.....	.....	
33,000	33,000	.00260	.00018	.....	.....	
34,000	34,000	.00300	.00040	.....	.....	
35,000	35,000	.00340	.00040	.00170	.00112	
36,000	36,000	.00380	.00040	.....	.....	
37,000	37,000	.00413	.00033	.....	.....	
38,000	38,000	.00453	.00040	.....	.....	
39,000	39,000	.00500	.00047	.....	.....	
40,000	40,000	.00582	.00082	.00378	.00208	Ultimate strength.
51,720	51,720	.....	.....	.....	.....	

Failed by triple flexure.

No. 4294.

Marks,  $^{12}M \overline{R}_1 T R_2$   
 $B T_1$ 

Length of stem, 23".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 20".

Applied load.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	.000015	.000015	
6,000	6,000	.000270	.000060	.....	.....	
7,000	7,000	.000330	.000060	.....	.....	
8,000	8,000	.000385	.000055	.....	.....	
9,000	9,000	.000440	.000055	.....	.....	
10,000	10,000	.000495	.000055	.000040	.000025	
11,000	11,000	.000555	.000060	.....	.....	
12,000	12,000	.000610	.000055	.000060	.000020	
13,000	13,000	.000680	.000070	.....	.....	
14,000	14,000	.000750	.000070	.000080	.000030	
15,000	15,000	.000810	.000080	.....	.....	
16,000	16,000	.000890	.000080	.000115	.000025	
17,000	17,000	.000965	.000075	.....	.....	
18,000	18,000	.001055	.000090	.000165	.000050	
19,000	19,000	.001155	.000100	.....	.....	
20,000	20,000	.001255	.000100	.000250	.000085	
21,000	21,000	.001375	.000120	.....	.....	
22,000	22,000	.001495	.000120	.000365	.000115	
23,000	23,000	.001655	.000160	.....	.....	
24,000	24,000	.001865	.000210	.000380	.000215	Tensile strength.
25,000	25,000	.002095	.000230	.000740	.000160	
32,070	32,070	.....	.....	.....	.....	

Fractured 1".5 from neck.

Appearance, uniform granular.

No. 4295.

Marks,  $^{12} M R_{31} T R_2$   
 $B T_{11}$ 

Length of stem, 15".75.

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00006	.00006	-----	-----	
3,000	3,000	.00011	.00005	-----	-----	
4,000	4,000	.00016	.00005	-----	-----	
5,000	5,000	.00021	.00005	0.	-----	
6,000	6,000	.00026	.00006	-----	-----	
7,000	7,000	.00031	.00005	-----	-----	
8,000	8,000	.00037	.00006	-----	-----	
9,000	9,000	.00042	.00005	-----	-----	
10,000	10,000	.00047	.00005	.00002	.00002	
11,000	11,000	.00052	.00005	-----	-----	
12,000	12,000	.00058	.00006	.00005	.00003	
13,000	13,000	.00065	.00007	-----	-----	
14,000	14,000	.00071	.00006	.00007	.00002	
15,000	15,000	.00078	.00007	-----	-----	
16,000	16,000	.00085	.00007	.00010	.00003	
17,000	17,000	.00092	.00007	-----	-----	
18,000	18,000	.00100	.00008	.00014	.00004	
19,000	19,000	.00110	.00010	-----	-----	
20,000	20,000	.00122	.00012	.00022	.00008	
21,000	21,000	.00133	.00011	-----	-----	Tensile strength.
22,000	22,000	.00148	.00015	.00036	.00014	
23,000	23,000	.00162	.00014	-----	-----	
24,000	24,000	.00180	.00018	.00057	.00021	
25,000	25,000	.00210	.00030	.00076	.00019	
32,210	32,210	-----	-----	-----	-----	

Fractured ".75 from neck.

Appearance, uniform granular.

## TENACITY SPECIMENS.

General marks,  $^{12} M R_{31} T R_2$ .

No. of test.	Additional marks.	Diameter.	Sectional area.	Tensile strength.		Specific gravity.	Hardness.
				Total.	Per square inch.		
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
4498	B T <sub>3</sub> I	1.129	1.00	32,530	32,530	-----	-----
4499	B T <sub>4</sub> O	1.129	1.00	34,990	34,990	7.3352	14.47
4500	B T <sub>5</sub> M	1.129	1.00	35,620	35,620	-----	-----
4501	B L <sub>6</sub> I	1.129	1.00	35,840	35,840	7.3486	14.90
4502	B L <sub>7</sub> O	1.129	1.00	34,270	34,270	7.3390	15.20
4503	B L <sub>8</sub> M	1.129	1.00	37,310	37,310	7.3475	16.31

## No. 880.

Marks,  ${}^{12}M R_{31} T R_2$   
 $B T_2$ 

Length, 12".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 10".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00005	.00005	.....	.....	
3,000	3,000	.00010	.00005	.....	.....	
4,000	4,000	.00015	.00005	.....	.....	
5,000	5,000	.00020	.00005	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00029	.00005	.....	.....	
8,000	8,000	.00034	.00005	.....	.....	
9,000	9,000	.00039	.00005	.....	.....	
10,000	10,000	.00044	.00005	.00001	.00001	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00061	.00005	.....	.....	
14,000	14,000	.00067	.00006	.....	.....	
15,000	15,000	.00071	.00004	.00006	.00005	
16,000	16,000	.00078	.00007	.....	.....	
17,000	17,000	.00086	.00008	.....	.....	
18,000	18,000	.00091	.00005	.....	.....	
19,000	19,000	.00096	.00005	.....	.....	
20,000	20,000	.00102	.00006	.00011	.00005	
21,000	21,000	.00109	.00007	.....	.....	
22,000	22,000	.00116	.00007	.....	.....	
23,000	23,000	.00122	.00006	.....	.....	
24,000	24,000	.00129	.00007	.....	.....	
25,000	25,000	.00136	.00007	.00022	.00011	
26,000	26,000	.00147	.00011	.....	.....	
27,000	27,000	.00159	.00012	.....	.....	
28,000	28,000	.00170	.00011	.....	.....	
29,000	29,000	.00181	.00011	.....	.....	
30,000	30,000	.00195	.00014	.00054	.00032	
31,000	31,000	.00212	.00017	.....	.....	
32,000	32,000	.00233	.00021	.....	.....	
33,000	33,000	.00256	.00023	.....	.....	
34,000	34,000	.00278	.00022	.....	.....	
35,000	35,000	.00302	.00024	.00126	.00082	
36,000	36,000	.00348	.00046	.....	.....	
37,000	37,000	.00378	.00030	.....	.....	
38,000	38,000	.00410	.00032	.....	.....	
39,000	39,000	.00455	.00045	.....	.....	
40,000	40,000	.00505	.00050	.00308	.00172	
52,900	52,900	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

H. Ex. 165—23

No. 881.

Marks,  $^{12}M R_{21} T R_2$   
 $B R_{10}$ 

Length, 10".

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 5".

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00038	.00004	.....	.....	
10,000	10,000	.00042	.00004	0.	.....	
11,000	11,000	.00046	.00004	.....	.....	
12,000	12,000	.00052	.00006	.....	.....	
13,000	13,000	.00058	.00006	.....	.....	
14,000	14,000	.00062	.00004	.....	.....	
15,000	15,000	.00068	.00006	.00004	.00004	
16,000	16,000	.00072	.00004	.....	.....	
17,000	17,000	.00078	.00006	.....	.....	
18,000	18,000	.00084	.00006	.....	.....	
19,000	19,000	.00090	.00006	.....	.....	
20,000	20,000	.00098	.00008	.00006	.00002	
21,000	21,000	.00104	.00006	.....	.....	
22,000	22,000	.00110	.00006	.....	.....	
23,000	23,000	.00116	.00006	.....	.....	
24,000	24,000	.00124	.00008	.....	.....	
25,000	25,000	.00132	.00008	.00020	.00014	
26,000	26,000	.00142	.00010	.....	.....	
27,000	27,000	.00152	.00010	.....	.....	
28,000	28,000	.00162	.00010	.....	.....	
29,000	29,000	.00174	.00012	.....	.....	
30,000	30,000	.00182	.00018	.00050	.00030	
31,000	31,000	.00210	.00018	.....	.....	
32,000	32,000	.00230	.00020	.....	.....	
33,000	33,000	.00250	.00020	.....	.....	
34,000	34,000	.00284	.00034	.....	.....	
35,000	35,000	.00320	.00036	.00152	.00102	
36,000	36,000	.00356	.00036	.....	.....	
37,000	37,000	.00384	.00028	.....	.....	
38,000	38,000	.00434	.00050	.....	.....	
39,000	39,000	.00486	.00052	.....	.....	
40,000	40,000	.00542	.00056	.00344	.00192	
62,270	62,270	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.



## 12-INCH B. L. RIFLED MORTARS.

## TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES.

No. of test.	Numbers.		Position in body.	Location of specimen.	Length of stem, inches.	Sectional area, Sq. inch.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
	Mor.	Specimen.									
3860	1	1	Breach		Inches. 24.25	1.00	Pounds. 28,010	Uniform granular			Condenned body.
3861	1	2	do		24.25	1.00	28,020	do			Do.
3862	1	1	do		22.88	1.00	30,020	do			Do.
3863	1	2	do		23.37	1.00	31,780	do			Do.
3863	1	3	do		Grooved	1.00	38,220	do			Do.
3864	1	4	do		do	1.00	30,730	do		15.20	Do.
3865	1	5	do		do	1.00	29,010	do			Do.
3866	1	3	do		do	1.00	31,840	do		14.76	Do.
3867	1	4	do		do	1.00	34,610	do			Do.
3868	1	5	do		do	1.00	33,430	do			Do.
3869	1	6	do		do	1.00	34,480	do		14.98	Do.
3870	1	7	do		do	1.00	31,170	do		15.75	Do.
3871	1	8	do		do	1.00	33,390	do		16.90	Do.
3812	2	1	Muzzle		24.10	.99	31,150	do			
3813	2	2	do		24.06	1.00	30,020	do		18.38	
3859	2	3	do		Grooved	1.00	32,710	do			
3860	2	4	do		do	1.00	31,690	do		7.2465	
3861	2	5	do		do	1.00	32,480	do		7.2370	
3853	2	3	Breach		do	1.00	31,670	do		18.19	
3854	2	4	do		do	1.00	32,580	do		18.78	
3855	2	5	do		do	1.00	32,350	do		7.2465	
3856	2	6	do		do	1.00	33,240	do		17.26	
3857	2	7	do		do	1.00	31,980	do		7.2435	
3858	2	8	do		do	1.00	31,340	do		7.2441	
3810	2	1	do		do	1.00	29,010	do		17.44	
3811	2	2	do		24.56	1.00	29,210	do			
3826	3	1	Muzzle		24.43	1.00	30,140	do			
3827	3	2	do		23.75	1.00	30,520	do			
3828	3	3	Breach		23.62	1.00	28,820	do			
3829	3	4	do		24.76	1.00	30,570	do			
3830	4	1	Muzzle		do	1.00	32,610	do			
3831	4	2	do		do	1.00	32,590	do			
3832	4	3	Breach		do	1.00	27,880	Granular, dark mottled		17.71	
3833	4	4	do		do	1.00	28,080	Granular, in part dark mottled			
3834	5	1	Muzzle		27.4	1.00	30,010	do			
3835	5	2	do		27.4	1.00	29,420	Granular, with dark spangles			
3836	5	3	Breach		27.4	1.00	28,890	Uniform granular			
3837	5	4	do		27.4	1.00	29,970	do			
3847	6	1	Muzzle		28.4	1.00	31,150	Granular, with dark spangles			



3096	13	3	do.	Inside.	Grooved.	1.00	23 190	do.	7.2904	17.35
3097	13	4	do.	Outside.	do.	1.00	22 640	do.	7.2872	16.56
3098	13	5	do.	Middle.	do.	1.00	23 510	do.	7.3001	16.73
3100	13	8	do.	Outside.	do.	1.00	23 790	do.		
3098½	13	1	Breach.	23	23	1.00	23 560	do.	7.2925	14.73
3095	13	2	do.	do.	23	1.00	21 220	do.		
3099	13	3	do.	Inside.	Grooved.	1.00	31 490	do.	7.2992	14.98
3100	13	4	do.	Outside.	do.	1.00	33 710	do.	7.2891	15.06
3101	13	5	do.	Middle.	do.	1.00	32 980	do.	7.2963	14.98
3102	13	6	do.	Inside.	do.	1.00	33 500	do.		
3103	13	7	do.	Outside.	do.	1.00	32 610	do.		
3104	13	8	do.	Middle.	do.	1.00	33 430	do.		
3090	14	1	Muzzle.	31 110	do.	1.00	31 110	do.	7.3017	15.35
3091	14	2	do.	do.	do.	1.00	30 020	do.	7.2942	17.26
3114	14	3	do.	Inside.	Grooved.	1.00	36 420	do.		
3115	14	4	do.	Outside.	do.	1.00	34 190	do.	7.3125	18.58
3116	14	5	do.	Middle.	do.	1.00	32 400	do.	7.3024	16.73
3117	14	8	do.	Outside.	do.	1.00	33 720	do.	7.3169	17.08
3098	14	1	Breach.	23	23	1.00	31 410	do.		
3099	14	2	do.	do.	do.	1.00	28 100	do.	7.3058	15.06
3105	14	3	do.	Inside.	Grooved.	1.00	34 310	do.		
3106	14	4	do.	Outside.	do.	1.00	33 120	do.		
3107	14	5	do.	Middle.	do.	1.00	33 710	do.		
3108	14	6	do.	Inside.	do.	1.00	33 200	do.	7.3147	15.75
3109	14	7	do.	Outside.	do.	1.00	33 580	do.	7.3192	15.20
3113	14	8	do.	Middle.	do.	1.00	33 970	do.	7.3145	15.13
4034	16	1	Muzzle.	23	23	1.00	23 310	Granular with dark spots	7.3149	15.75
4035	16	2	do.	do.	do.	1.00	23 800	do.		
3132	16	3	do.	Inside.	Grooved.	1.00	35 680	Uniform granular.	7.3307	17.99
3133	16	4	do.	Outside.	do.	1.00	31 170	do.	7.3378	15.91
3134	16	5	do.	Middle.	do.	1.00	36 220	do.	7.3699	17.62
3135	16	8	do.	Outside.	do.	1.00	33 490	do.		
4049	16	1	Breach.	23	23	1.00	24 900	Coarse and fine granular with stellar spots	7.3209	14.69
4050	16	2	do.	do.	do.	1.00	30 210	Coarse and medium granular		
3126	16	3	do.	Inside.	Grooved.	1.00	32 990	do.	7.3140	14.12
3127	16	4	do.	Outside.	do.	1.00	34 020	do.	7.3141	14.12
3128	16	5	do.	Middle.	do.	1.00	31 510	do.	7.3314	15.06
3129	16	6	do.	Inside.	do.	1.00	34 070	do.	7.3398	14.69
3130	16	7	do.	Outside.	do.	1.00	34 730	do.	7.3294	14.98
3131	16	8	do.	Middle.	do.	1.00	37 640	do.	7.3332	15.20
4038	17	1	Muzzle.	23	23	1.00	29 410	Granular with dark spots	7.3023	14.47
4039	17	2	do.	do.	do.	1.00	28 270	do.		
4397	17	3	do.	Inside.	Grooved.	1.00	35 310	do.	7.3490	15.83
4398	17	4	do.	Outside.	do.	1.00	34 300	do.	7.3358	14.98
4399	17	5	do.	Middle.	do.	1.00	33 960	do.	7.3292	14.90
4400	17	8	do.	Outside.	do.	1.00	34 510	do.		
4036	17	1	Breach.	23	23	1.00	23 210	Coarse and fine granular.	7.3109	13.46
4037	17	2	do.	do.	do.	1.00	29 530	do.		
4391	17	3	do.	Inside.	Grooved.	1.00	30 200	do.		
4392	17	4	do.	Outside.	do.	1.00	30 010	do.		
4393	17	5	do.	Middle.	do.	1.00	34 310	do.		
4394	17	8	do.	Inside.	do.	1.00	31 990	do.	7.3325	14.90

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Numbers.		Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
	Mor.	Specimen.									
4395	17	7	Breach	Outside	Inches. Grooved	Sq. inch. 1.00	Pounds. 36,970		7.3124	15.13	
4396	17	8	do	Middle	do	1.00	34,930		7.2860	13.99	
4074	18	1	Muzzle		23	1.00	29,630	Granular mottled	7.2990	16.15	
4075	18	2	do		23	1.00	29,870				
4407	18	3	do	Inside	Grooved	1.00	33,990		7.2977	17.81	
4408	18	4	do	Outside	do	1.00	34,430		7.3183	16.31	
4409	18	5	do	Middle	do	1.00	32,600		7.3124	17.26	
4410	18	6	do	Outside	do	1.00	35,170				
4072	18	1	Breach		23	1.00	28,010	Medium fine granular with dark spots	7.2927	14.69	
4073	18	2	do		23	1.00	27,260	do			
4401	18	3	do	Inside	Grooved	1.00	33,250				
4402	18	4	do	Outside	do	1.00	35,010				
4403	18	5	do	Middle	do	1.00	31,440				
4404	18	6	do	Inside	do	1.00	36,020		7.2977	16.91	
4405	18	7	do	Outside	do	1.00	37,480		7.2865	15.20	
4406	18	8	do	Middle	do	1.00	37,350		7.2945	15.43	
4047	19	1	Muzzle		23	1.00	29,910	Medium coarse granular with dark spots	7.3160	15.75	
4048	19	2	do		23	1.00	29,670	do			
3122	19	3	do	Inside	Grooved	1.00	33,390		7.3219	16.56	
3123	19	4	do	Outside	do	1.00	31,610		7.3205	15.91	
3124	19	5	do	Middle	do	1.00	31,040		7.3276	16.56	
3125	19	8	do	Outside	do	1.00	33,800				
3992	19	1	Breach		23	1.00	25,510	Granular	7.3120	14.19	
2993	19	2	do		23	1.00	20,610	Uniform granular			
3119	19	3	do	Inside	Grooved	1.00	30,090				
3120	19	4	do	Outside	do	1.00	33,320				
3121	19	5	do	Middle	do	1.00	31,140				
3110	19	6	do	Inside	do	1.00	31,410		7.3215	14.69	
3111	19	7	do	Outside	do	1.00	32,040		7.3139	14.69	
3112	19	8	do	Middle	do	1.00	31,590		7.3224	15.13	
4078	20	2	Muzzle		23	1.00	29,080	Granular, mottled			
4418	20	3	do	Inside	Grooved	1.00	34,150		7.3191	17.17	
4419	20	4	do	Outside	do	1.00	32,700		7.3232	16.07	
4420	20	5	do	Middle	do	1.00	32,450		7.3324	16.90	
4421	20	6	do	Outside	do	1.00	33,720		7.3015	15.59	
4076	20	2	Breach		23	1.00	30,590	Uniform granular	7.3163	14.33	
4077	20	11	do		23	1.00	31,410	do			
4411	20	3	do	Inside	Grooved	1.00	32,510				
4412	20	4	do	Outside	do	1.00	33,690				
4413	20	5	do	Middle	do	1.00	33,610				
4414	20	6	do	Inside	do	1.00	34,990		7.3191	15.43	
4415	20	7	do	Outside	do	1.00	33,840		7.3148	14.98	

4416	20	8	do	Middle	do	1.00	33,340	7.3237	15.86
4417	21	9	do	do	do	1.00	31,970		
4404	21	9	Muzzle	do	23	1.00	28,350		
4429	21	3	do	Inside	Grooved	1.00	33,610	7.8105	15.91
4430	21	4	do	Outside	do	1.00	31,520	7.3122	15.43
4431	21	5	do	Middle	do	1.00	31,700	7.3778	16.48
4432	21	6	do	Outside	do	1.00	34,800	7.3158	15.99
4433	21	6	do	Outside	do	1.00	29,630	7.3128	14.33
4406	21	2	Breach	do	23	1.00	31,280		
4432	21	11	do	do	9, 4	1.00	30,970		
4432	21	3	do	Inside	Grooved	1.00	30,530		
4432	21	4	do	Outside	do	1.00	30,410		
4424	21	5	do	Middle	do	1.00	31,170		
4425	21	6	do	Inside	do	1.00	31,960	7.8136	13.85
4426	21	7	do	Outside	do	1.00	31,590	7.3124	14.69
4427	21	8	do	Middle	do	1.00	36,070	7.8143	14.40
4418	21	9	do	do	do	1.00	29,520		
4424	21	9	Muzzle	do	23	1.00	32,040		
4439	22	3	do	Inside	Grooved	1.00	31,120	7.3235	17.44
4440	22	4	do	Outside	do	1.00	31,530	7.3278	16.73
4441	22	5	do	Middle	do	1.00	32,890	7.3326	17.26
4442	22	5	do	Outside	do	1.00	26,520	7.3279	15.59
4422	22	1	Breach	do	23	1.00	24,980	7.3253	15.75
4423	22	2	do	do	23	1.00	30,820		
4433	22	3	do	Inside	Grooved	1.00	33,640		
4434	22	4	do	Outside	do	1.00	30,690		
4435	22	4	do	Middle	do	1.00	30,790	7.3248	15.07
4436	22	5	do	Inside	do	1.00	31,510	7.3381	14.98
4437	22	6	do	Outside	do	1.00	30,500	7.3289	14.06
4438	22	7	do	Middle	do	1.00	30,500		
4450	23	3	Muzzle	do	23	1.00	33,470		
4450	23	3	do	Inside	Grooved	1.00	33,470	7.3137	16.52
4451	23	4	do	Outside	do	1.00	26,210	7.3153	16.56
4452	23	5	do	Middle	do	1.00	32,640	7.3288	17.62
4453	23	6	do	Outside	do	1.00	32,390	7.3101	16.23
4423	23	2	Breach	do	23	1.00	26,140		
4427	23	11	do	do	94	1.00	30,713		
4443	23	3	do	Inside	Grooved	1.00	29,970		
4444	23	4	do	Outside	do	1.00	23,700	7.3074	14.90
4445	23	5	do	Middle	do	1.00	31,560		
4446	23	5	do	Inside	do	1.00	29,810	7.3121	14.90
4447	23	6	do	Outside	do	1.00	33,050	7.3127	14.70
4448	23	7	do	Outside	do	1.00	32,020	7.3136	15.05
4449	23	8	do	Middle	do	1.00	26,040		
4449	23	9	do	do	do	1.00	30,580		
4160	24	3	Muzzle	do	23	1.00	32,980	7.3230	19.08
4454	24	3	do	Inside	Grooved	1.00	32,960	7.3184	17.62
4455	24	4	do	Outside	do	1.00	32,210	7.3321	18.28
4456	24	5	do	Middle	do	1.00	34,270	7.3203	16.99
4457	24	6	do	Outside	do	1.00	26,030		
4461	24	1	Breach	do	23	1.00	29,990		
4462	24	11	do	do	15, 75	1.00			

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Numbers.		Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.	
	Mor-tar.	Specimen.										
4458	24	3	Breach.....	Inside.....	Inches. Grooved.....	Sq. inch. 1.00	Pounds. 30,910	Uniform granular.	7.3153	15.51		
4459	24	4	do.....	Outside.....	do.....	1.00	32,990					
4460	24	5	do.....	Middle.....	do.....	1.00	32,450			7.3160	15.51	
4461	24	6	do.....	Inside.....	do.....	1.00	33,920			7.3148	15.28	
4462	24	7	do.....	Outside.....	do.....	1.00	31,030	Granular, mottled	7.3183	15.33		
4463	24	8	do.....	Middle.....	do.....	1.00	32,650					
4464	25	3	Muzzle.....	Inside.....	23 Grooved.....	1.00	28,460			7.3094	16.56	
4470	25	4	do.....	Outside.....	do.....	1.00	32,590			7.3072	14.98	
4471	25	5	do.....	Middle.....	do.....	1.00	30,740	Uniform granular	7.3083	13.20		
4472	25	6	do.....	Outside.....	do.....	1.00	29,930			7.3003	13.91	
4473	25	7	Breach.....	Inside.....	23 Grooved.....	1.00	33,470					
4474	25	8	do.....	Outside.....	do.....	1.00	29,620					
4475	25	9	do.....	Middle.....	do.....	1.00	32,410	Granular, with coarse dark spangles.	7.2991	13.28		
4476	25	10	do.....	Inside.....	do.....	1.00	33,720					
4477	25	11	do.....	Outside.....	do.....	1.00	33,560					
4478	25	12	do.....	Middle.....	do.....	1.00	34,130			7.3073	16.33	
4479	25	13	do.....	Inside.....	do.....	1.00	33,890	Uniform granular.	7.3104	16.23		
4480	25	14	do.....	Outside.....	do.....	1.00	35,830			7.3158	15.75	
4481	25	15	do.....	Middle.....	do.....	1.00	37,600					
4482	26	1	Muzzle.....	Inside.....	23 Grooved.....	1.00	20,890			7.2062	14.05	
4483	26	2	do.....	Outside.....	do.....	1.00	29,520	Uniform granular.	7.3054	14.12		
4484	26	3	do.....	Middle.....	do.....	1.00	28,040			7.3063	14.76	
4485	26	4	do.....	Inside.....	do.....	1.00	29,050			7.2995	13.72	
4486	26	5	do.....	Outside.....	do.....	1.00	31,530					
4487	26	6	Breach.....	Inside.....	23 Grooved.....	1.00	27,980	Granular and dark mottled.	7.3041	14.98		
4488	26	7	do.....	Outside.....	do.....	1.00	28,270					
4489	26	8	do.....	Middle.....	do.....	1.00	29,810					
4490	26	9	do.....	Inside.....	do.....	1.00	33,400			7.3067	14.76	
4491	26	10	do.....	Outside.....	do.....	1.00	30,380	Uniform granular.	7.3058	15.20		
4492	26	11	do.....	Middle.....	do.....	1.00	30,650			7.3082	15.13	
4493	26	12	do.....	Inside.....	do.....	1.00	29,970					
4494	26	13	do.....	Outside.....	do.....	1.00	31,260					
4495	26	14	do.....	Middle.....	do.....	1.00	26,940	Uniform granular.	7.2984	14.33		
4496	26	15	Muzzle.....	Inside.....	23 Grooved.....	1.00	30,260			7.3036	15.05	
4497	26	16	do.....	Outside.....	do.....	1.00	29,980			7.3015	15.20	
4498	26	17	do.....	Middle.....	do.....	1.00	29,010			7.2972	14.40	
4499	26	18	do.....	Inside.....	do.....	1.00	31,170	Uniform granular.				
4500	26	19	Breach.....	Outside.....	23 Grooved.....	1.00	27,400					
4501	26	20	do.....	Middle.....	do.....	1.00	27,030					
4502	26	21	do.....	Inside.....	do.....	1.00	29,420					

4529	27	4	do	Outside	do	1.00	32,690	Granular, stellar spots	7,2988	15.05
4530	27	5	do	Middle	do	1.00	30,070		7,3041	14.90
4531	27	6	do	Inside	do	1.00	29,960		7,3045	14.83
4532	27	7	do	Outside	do	1.00	31,240		7,3062	15.05
4533	27	8	do	Middle	do	1.00	31,500			
4197	28	2	Muzzle	do	23	1.00	25,120		7,3076	14.54
4514	28	3	do	Inside	Grooved	1.00	29,800		7,3183	14.69
4515	28	4	do	Outside	do	1.00	29,440		7,3160	15.51
4516	28	5	do	Middle	do	1.00	29,970		7,3185	14.69
4517	28	6	do	Outside	do	1.00	32,400			
4198	28	1	Breach	do	23	1.00	26,170	Uniform granular		
4199	28	11	do	do	15.75	1.00	28,180	do		
4518	28	3	do	Grooved	do	1.00	30,650		7,3132	15.20
4519	28	4	do	do	do	1.00	32,050			
4520	28	5	do	do	do	1.00	30,040			
4521	28	6	do	do	do	1.00	30,520			
4522	28	7	do	do	do	1.00	31,640		7,3137	15.13
4523	28	8	do	do	do	1.00	31,970		7,3168	14.98
4159	29	2	Muzzle	do	23	1.00	27,510	Granular, mottled	7,3157	14.47
4480	29	3	do	Inside	Grooved	1.00	31,540			
4481	29	4	do	Outside	do	1.00	30,010		7,3389	15.59
4482	29	5	do	Middle	do	1.00	30,400		7,3327	14.98
4483	29	6	do	Outside	do	1.00	32,720		7,3349	15.51
4157	29	1	Breach	do	23	1.00	26,700	Uniform granular	7,3350	14.98
4158	29	11	do	do	15.75	1.00	25,640	do		
4474	29	3	do	Inside	Grooved	1.00	29,810		7,3319	15.75
4475	29	4	do	Outside	do	1.00	32,670			
4476	29	5	do	Middle	do	1.00	30,610		7,3432	15.59
4477	29	6	do	Inside	do	1.00	32,290		7,3427	16.73
4478	29	7	do	Outside	do	1.00	32,070		7,3456	15.59
4479	29	8	do	Middle	do	1.00	32,020			
4169	30	2	Muzzle	do	23	1.00	23,980	Granular, with dark colored spangles		
4484	30	3	do	Inside	do	1.00	29,630		7,3166	14.26
4485	30	4	do	Outside	do	1.00	29,470		7,3185	14.12
4486	30	5	do	Middle	do	1.00	30,260		7,3250	14.76
4487	30	6	do	Outside	do	1.00	31,940		7,3245	14.40
4167	30	1	Breach	do	23	1.00	27,710	Uniform granular		
4168	30	11	do	do	15.75	1.00	29,270	Granular, with dark spangles		
4488	30	3	do	Inside	do	1.00	29,610			
4489	30	4	do	Outside	do	1.00	34,310		7,3350	15.13
4490	30	5	do	Middle	do	1.00	30,300			
4491	30	6	do	Inside	Grooved	1.00	29,820		7,3297	14.90
4492	30	7	do	Outside	do	1.00	32,240		7,3277	15.28
4493	30	8	do	Middle	do	1.00	32,980		7,3215	14.26
4293	31	2	Muzzle	do	22	1.00	28,990			
4494	31	3	do	Inside	Grooved	1.00	31,070	Granular, dark mottled	7,3366	14.83
4495	31	4	do	Outside	do	1.00	30,250		7,3381	14.69
4496	31	5	do	Middle	do	1.00	29,870		7,3326	15.28
4497	31	6	do	Outside	do	1.00	33,450		7,3368	14.12
4294	31	1	Breach	do	23	1.00	32,070	Uniform granular		

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Numbers.		Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
	Mor. tar.	Specimen.									
4495	31	11	Breach.....	.....	<i>Inches.</i> 15.75	<i>Sq. inch.</i> 1.00	<i>Pounds.</i> 32,210	Uniform granular.....	.....	.....	
4498	31	3	do.....	Inside.....	Grooved.....	1.00	32,530	.....	.....	.....	
4499	31	4	do.....	Outside.....	do.....	1.00	34,950	.....	7.3352	14.47	
4500	31	5	do.....	Middle.....	do.....	1.00	35,620	.....	.....	.....	
4501	31	6	do.....	Inside.....	do.....	1.00	35,840	.....	7.3486	14.90	
4502	31	7	do.....	Outside.....	do.....	1.00	34,270	.....	7.3390	15.20	
4503	31	8	do.....	Middle.....	do.....	1.00	37,310	.....	7.3475	16.31	



12-INCH B. L. RIFLED MORTARS.  
 TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES.

No. of test.	Numbers.		Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Specific gravity.	Hard- ness.	Remarks.
	Mor- tar.	Speci- men.									
90	1	9	Breach.....	Radial.....	Inches. 12	Sq. inch. 1.00	Pounds. 51,480	Triple flexure.	.....	.....	Condemned body. Do. Do. Do. Do.
91	1	10	do.....	.....	10 5	.....	60,150	do.....	.....	.....	
92	1	9	do.....	Radial.....	12	1.00	54,600	do.....	.....	.....	
93	1	10	do.....	Radial.....	10	1.00	63,800	do.....	.....	.....	
94	2	9	do.....	.....	12	1.00	56,500	do.....	.....	.....	
95	2	10	do.....	Radial.....	10 70	1.00	62,150	do.....	.....	.....	
96	3	9	do.....	.....	12	1.00	54,890	do.....	.....	.....	
97	3	10	do.....	.....	10 5	1.00	60,180	do.....	.....	.....	
98	4	9	do.....	.....	12	1.00	53,120	do.....	.....	.....	
99	4	10	do.....	.....	10 5	1.00	58,600	do.....	.....	.....	
100	5	9	do.....	Radial.....	12	1.00	61,940	do.....	.....	.....	
101	5	10	do.....	.....	10 69	1.00	56,150	do.....	.....	.....	
102	6	9	do.....	Radial.....	12	1.00	67,260	do.....	.....	.....	
103	6	10	do.....	.....	10	1.00	55,260	do.....	.....	.....	
104	7	9	do.....	Radial.....	12	1.00	65,610	do.....	.....	.....	
105	7	10	do.....	.....	10	1.00	56,300	do.....	.....	.....	
106	8	9	do.....	Radial.....	12	1.00	64,400	do.....	.....	.....	
107	8	10	Muzzle.....	.....	10	1.00	56,060	do.....	.....	.....	
108	9	9	do.....	.....	12	1.00	53,580	do.....	.....	.....	
109	9	10	Breach.....	Radial.....	12	1.00	62,800	do.....	.....	.....	
110	10	9	do.....	.....	10	1.00	61,750	do.....	.....	.....	
111	10	10	Muzzle.....	.....	12	1.00	60,620	do.....	.....	.....	
112	11	9	do.....	Radial.....	12	1.00	54,100	do.....	.....	.....	
113	11	10	do.....	.....	10	1.00	61,980	do.....	.....	.....	
114	11	9	Muzzle.....	.....	12	1.00	55,400	do.....	.....	.....	
115	12	9	Breach.....	Radial.....	12	1.00	52,200	do.....	.....	.....	
116	12	10	do.....	.....	10	1.00	62,600	do.....	.....	.....	
117	12	9	Muzzle.....	.....	12	1.00	57,910	do.....	.....	.....	
118	12	10	Breach.....	Radial.....	12	1.00	51,650	do.....	.....	.....	
119	13	9	do.....	.....	10	1.00	60,800	do.....	.....	.....	
120	13	10	Muzzle.....	.....	12	1.00	55,620	do.....	.....	.....	
121	13	9	Breach.....	Radial.....	12	1.00	63,250	do.....	.....	.....	
122	13	10	do.....	.....	10	1.00	51,980	do.....	.....	.....	
123	14	9	Muzzle.....	.....	12	1.00	50,600	do.....	.....	.....	
124	14	10	Breach.....	Radial.....	12	1.00	60,520	do.....	.....	.....	
125	15	9	do.....	.....	10	1.00	54,500	do.....	.....	.....	
126	15	10	Muzzle.....	.....	12	1.00	54,500	do.....	.....	.....	
127	16	9	Breach.....	Radial.....	12	1.00	54,500	do.....	.....	.....	
128	16	10	do.....	.....	10	1.00	54,500	do.....	.....	.....	
129	17	9	Muzzle.....	.....	12	1.00	54,500	do.....	.....	.....	
130	17	10	Breach.....	Radial.....	12	1.00	54,500	do.....	.....	.....	
131	17	9	do.....	.....	10	1.00	54,500	do.....	.....	.....	
132	17	10	Muzzle.....	.....	12	1.00	54,500	do.....	.....	.....	
133	18	9	do.....	.....	10	1.00	54,500	do.....	.....	.....	

TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Numbers.		Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Specific gravity.	Hardness.	Remarks.
	Mo.	Specimen.									
848	18	9	Breach	Radial	12.	Sq. inch.	Pounds.	Triple flexure.			
849	18	10	do	do	10.	1.00	50,480	do			
841	19	9	Muzzle	do	12.	1.00	58,250	do			
839	19	9	Breach	do	12.	1.00	56,380	do			
840	19	10	do	Radial	12.	1.00	51,800	do			
851	20	1	Muzzle	do	12.	1.00	61,900	do			
852	20	1	Breach	do	12.	1.00	56,650	do			
853	20	10	do	Radial	12.	1.00	51,200	do			
856	21	1	Muzzle	do	12.	1.00	61,020	do			
854	21	1	Breach	do	12.	1.00	55,900	do			
855	21	10	do	Radial	12.	1.00	50,400	do			
859	22	9	Muzzle	do	12.	1.00	60,980	do			
858	22	10	do	do	12.	1.00	57,160	do			
857	22	10	do	do	12.	1.00	52,250	do			
862	23	1	Muzzle	do	12.	1.00	62,540	do			
860	23	1	Breach	do	12.	1.00	57,940	do			
861	23	10	do	Radial	12.	1.00	52,300	do			
863	24	1	do	do	12.	1.00	61,460	do			
864	24	2	Muzzle	do	12.	1.00	58,560	do			
865	24	10	Breach	do	12.	1.00	54,190	do			
869	25	1	do	Radial	12.	1.00	64,580	do			
866	25	1	Muzzle	do	12.	1.00	51,290	do			
867	25	9	Breach	do	12.	1.00	52,150	do			
868	25	10	do	do	12.	1.00	51,520	do			
877	26	1	do	Radial	12.	1.00	60,650	do			
878	26	2	Muzzle	do	12.	1.00	51,100	do			
879	26	10	Breach	do	12.	1.00	53,050	do			
885	27	1	do	Radial	9.43	1.00	63,680	do			
886	27	10	Muzzle	do	12.	1.00	50,230	do			
887	27	2	Breach	do	12.	1.00	50,420	do			
882	28	1	do	Radial	8.31	1.00	70,040	do			
883	28	2	Muzzle	do	12.	1.00	51,960	do			
884	28	10	Breach	do	12.	1.00	62,100	do			
872	29	1	do	Radial	12.	1.00	61,040	do			
870	29	2	Muzzle	do	12.	1.00	51,450	do			
871	29	10	Breach	do	12.	1.00	53,060	do			
873	30	1	do	Radial	10.	1.00	62,500	do			
874	30	2	Muzzle	do	12.	1.00	50,780	do			
875	30	10	Breach	do	12.	1.00	52,700	do			
876	31	1	do	Radial	10.	1.00	61,050	do			
876	31	1	Muzzle	do	12.	1.00	51,720	do			
880	31	2	Breach	do	12.	1.00	52,900	do			
881	31	10	do	Radial	10.	1.00	62,270	do			

---

# 12-INCH B. L. RIFLED MORTARS.

---

STEEL HOOPS AND GAS CHECKS.

---



## 12-INCH B. L. MORTAR, NO. 1.

## TRUNNION HOOP.

No. 3917.

Marks, <sup>12 M R, T H</sup><sub>T<sub>10</sub> O</sub>Diameter, <sup>T<sub>10</sub> O</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000175	.000175	0.	0.	
2,500	10,000	.000450	.000275	0.	0.	
5,000	20,000	.000800	.000350	0.	0.	
7,500	30,000	.001175	.000375	0.	0.	
10,000	40,000	.001500	.000325	0.	0.	
11,250	45,000	.001875	.000175	.000050	.000030	
12,000	48,000	.001750	.000075	.000075	.000025	
12,250	49,000	.001800	.000050	0.	0.	
12,500	50,000	.001875	.000075	0.	0.	
12,750	51,000	.001925	.000050	0.	0.	Elastic limit.
13,000	52,000	.001975	.000050	0.	0.	
13,250	53,000	.002075	.000100	0.	0.	
13,500	54,000	.002250	.000175	0.	0.	
13,750	55,000	.002400	.000150	0.	0.	
14,250	57,000	.002800	.000400	0.	0.	
14,750	59,000	.004000	.001200	0.	0.	
15,250	61,000	.005500	.001500	0.	0.	
15,750	63,000	.006750	.001250	0.	0.	
16,250	65,000	.007750	.001000	0.	0.	
25,360	101,440	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 101,440  
 Elastic limit per square inch of original section..... do... 52,000  
 Elongation per inch after rupture..... inch... .1700  
 Elongation per inch under strain at elastic limit..... do... .001975  
 Reduction in diameter at point of rupture..... do... .114  
 Reduction in area after rupture, per centum of original section..... 36.4  
 Position of rupture..... 2" from neck  
 Character of broken surface..... granular, silky center  
 Elongation of inch sections..... ".10, ".31, ".15, ".12

## 12-INCH B. L. MORTAR, NO. 2.

## TRUNNION HOOP.

No. 3814.

Marks, <sup>12</sup>MR<sub>2</sub>THDiameter, <sup>T<sub>1</sub>O</sup> ".564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000175	.000175	0.	0.	
2,500	10,000	.000300	.000125	.....	.....	
5,000	20,000	.000550	.000250	.....	.....	
7,500	30,000	.000925	.000375	.....	.....	
10,000	40,000	.001300	.000375	.....	.....	
11,250	45,000	.001450	.000150	0.	.....	
12,000	48,000	.001550	.000100	0.	.....	
12,250	49,000	.001575	.000025	.....	.....	
12,500	50,000	.001650	.000075	.....	.....	
12,750	51,000	.001700	.000050	.....	.....	
13,000	52,000	.001750	.000050	.....	.....	Elastic limit.
13,250	53,000	.001800	.000050	.....	.....	
13,500	54,000	.001950	.000150	.....	.....	
13,750	55,000	.002175	.000225	.....	.....	
14,000	56,000	.002500	.000325	.....	.....	
14,500	58,000	.003550	.001050	.....	.....	
15,000	60,000	.005000	.001450	.....	.....	
15,500	62,000	.006750	.001750	.....	.....	
16,000	64,000	.008250	.001500	.....	.....	
16,500	66,000	.009875	.001625	.....	.....	Tensile strength.
25,300	101,440	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 101,440  
 Elastic limit per square inch of original section.....do... 53,000  
 Elongation per inch after rupture.....inch.. 0.1625  
 Elongation per inch under strain at elastic limit.....do... .001800  
 Reduction in diameter at point of rupture.....do... .114  
 Reduction in area after rupture, per centum of original section.....do... 36.4  
 Position of rupture.....1" from neck  
 Character of broken surface.....silky center, granular at circumference  
 Elongation of inch sections.....".09, ".11, ".17, ".28\*

HOOP A<sub>7</sub>.

No. 3928.

Marks, <sup>12 M B, A,</sup><sub>T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	.....	.....	
5,000	20,000	.000650	.000350	.....	.....	
7,500	30,000	.001025	.000375	.....	.....	
10,000	40,000	.001375	.000350	.....	.....	
11,250	45,000	.001550	.000175	.000025	.000025	Elastic limit.
12,500	50,000	.001775	.000225	.000050	.000025	
12,750	51,000	.001825	.000050	.....	.....	
13,000	52,000	.002100	.000275	.....	.....	
13,250	53,000	.002250	.000150	.....	.....	
13,500	54,000	.002400	.000150	.....	.....	
14,000	56,000	.002575	.000175	.....	.....	
14,500	58,000	.003175	.000600	.....	.....	
15,000	60,000	.004125	.000950	.....	.....	
15,400	62,000	.005750	.001625	.....	.....	
15,800	64,000	.007000	.001250	.....	.....	Tensile strength.
26,310	105,240	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 105,240  
 Elastic limit per square inch of original section .....do... 51,000  
 Elongation per inch after rupture .....inch.. 0.1275  
 Elongation per inch under strain at elastic limit .....do... .001825  
 Reduction in diameter at point of rupture ..... .064  
 Reduction in area after rupture, per centum of original section ..... 21.4  
 Position of rupture ..... 2".25 from neck  
 Character of broken surface .....granular; dull spot at circumference  
 Elongation of inch sections .....".18, ".16", ".16", ".11

H. Ex. 165—24

No. 3929.

Marks, <sup>12 M R<sub>2</sub> A<sub>7</sub></sup>  
<sub>T<sub>5</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000350	.000225	.....	.....	
5,000	20,000	.000725	.000375	.....	.....	
7,500	30,000	.001200	.000475	.....	.....	
10,000	40,000	.001475	.000275	.....	.....	
11,250	45,000	.001700	.000225	.000125	.000125	Elastic limit (approximate).
12,500	50,000	.001975	.000275	.000250	.000125	
12,750	51,000	.002050	.000075	.....	.....	
13,000	52,000	.002175	.000125	.....	.....	
13,250	53,000	.002300	.000125	.....	.....	
13,750	55,000	.002625	.000325	.....	.....	
14,250	57,000	.003300	.000675	.....	.....	Tensile strength.
14,750	59,000	.004375	.001075	.....	.....	
15,250	61,000	.005900	.001525	.....	.....	
15,750	63,000	.007500	.001600	.....	.....	
25,640	102,560	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section..... pounds.. 102,560  
 Elastic limit per square inch of original section..... do... 50,000  
 Elongation per inch after rupture..... inch... 0.1475  
 Elongation per inch under strain at elastic limit..... do... .001975  
 Reduction in diameter at point of rupture..... do... .084  
 Reduction in area after rupture, per centum of original section..... 27.6  
 Position of rupture..... 1".75 from neck  
 Character of broken surface..... granular, 80 per cent.; dull silky, 20 per cent.  
 Elongation of inch sections..... ".11, ".24, ".13, ".11



No. 3930.

Marks, <sup>12 M R<sub>2</sub> A,</sup>  
<sub>T<sub>8</sub> I</sub>Diameter, <sup>12 M R<sub>2</sub> A,</sup>  
<sub>T<sub>8</sub> I</sub> ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	0.	0.	
5,000	20,000	.000625	.000325	0.	0.	
7,500	30,000	.000950	0.	0.	0.	
10,000	40,000	.001300	.000350	0.	0.	Elastic limit below 50,000 lbs. per sq. inch.
11,250	45,000	.001550	.000250	.000025	.000025	
12,500	50,000	.002275	.000725	.000550	.000525	
12,750	51,000	.002675	.000400	0.	0.	
13,000	52,000	.002925	.000250	0.	0.	
13,250	53,000	.003225	.000300	0.	0.	Tensile strength.
13,750	55,000	.004500	.001275	0.	0.	
14,250	57,000	.006375	.001875	0.	0.	
14,750	59,000	.008125	.001750	0.	0.	
15,250	61,000	.009500	.001375	0.	0.	
15,750	63,000	.011375	.001875	0.	0.	
24,470	97,880	0.	0.	0.	0.	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 97,880  
 Elongation per inch after rupture ..... inch.. 0.1575  
 Reduction in diameter at point of rupture ..... do... .114  
 Reduction in area after rupture, per centum of original section ..... 36.4  
 Position of rupture ..... 2" from neck  
 Character of broken surface.....dull, silky, 85 per cent.; granular, 15 per cent.  
 Elongation of inch sections.....".11, ".30\*, ".13, ".09

HOOP B<sub>3</sub>.

No. 3924.

Marks, <sup>12 M R<sub>3</sub> B<sub>3</sub></sup><sub>T<sub>3</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000400	.000250	.....	.....	
5,000	20,000	.000675	.000275	.....	.....	
7,500	30,000	.001000	.000325	.....	.....	
10,000	40,000	.001350	.000350	.....	.....	
11,250	45,000	.001550	.000200	.000050	.000050	
12,500	50,000	.001750	.000200	.000050	0.	
12,750	51,000	.001800	.000050	.....	.....	
13,000	52,000	.001825	.000025	.....	.....	
13,250	53,000	.001900	.000075	.....	.....	
13,500	54,000	.001950	.000050	.....	.....	
13,750	55,000	.001975	.000025	.....	.....	
14,000	56,000	.002025	.000050	.....	.....	
14,250	57,000	.002150	.000125	.....	.....	Elastic limit (not well defined).
14,500	58,000	.002250	.000100	.....	.....	
14,750	59,000	.002350	.000100	.....	.....	
15,250	61,000	.002675	.000325	.....	.....	
17,750	63,000	.003450	.000775	.....	.....	
16,250	65,000	.004925	.001475	.....	.....	Tensile strength.
16,750	67,000	.006700	.001775	.....	.....	
17,250	69,000	.008625	.001925	.....	.....	
26,320	105,280	.....	.....	.....	.....	
		.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 105,280  
 Elastic limit per square inch of original section (not well defined).....do... 56,000  
 Elongation per inch after rupture.....inch... 0.1650  
 Elongation per inch under strain at elastic limit.....do... .002025  
 Reduction in diameter at point of rupture.....do... .084  
 Reduction in area after rupture, per centum of original section.....do... 27.6  
 Position of rupture.....1" from neck  
 Character of broken surface.....granular, radiating from a point in the circumference  
 Elongation of inch sections.....". 12, ". 17, ". 16, ". 21"

No. 3925.

Marks,  $^{12} M R_2 B_3$   
 $T_1 M$ Diameter,  $\frac{1}{4}$  .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	0.	0.	
5,000	20,000	.000650	.000350	0.	0.	
7,500	30,000	.001025	.000375	0.	0.	
10,000	40,000	.001375	.000350	0.	0.	
11,250	45,000	.001575	.000200	.000025	.000025	
12,500	50,000	.001825	.000250	.000075	.000050	
12,750	51,000	.001850	.000025	0.	0.	
13,000	52,000	.001975	.000125	0.	0.	Elastic limit.
13,250	53,000	.002075	.000100	0.	0.	
13,500	54,000	.002300	.000225	0.	0.	
14,000	56,000	.002925	.000600	0.	0.	
14,500	58,000	.004375	.000450	0.	0.	
15,000	60,000	.006125	.001750	0.	0.	
15,500	62,000	.007875	.001750	0.	0.	
16,000	64,000	.009375	.001500	0.	0.	
25,260	101,040	0.	0.	0.	0.	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 101,040  
 Elastic limit per square inch of original section.....do.. 51,000  
 Elongation per inch after rupture.....inch.. 0.1525  
 Elongation per inch under strain at elastic limit.....do.. .001850  
 Reduction in diameter at point of rupture.....do.. .104  
 Reduction in area after rupture, per centum of original section.....33.5  
 Position of rupture.....2" .15 from neck  
 Character of broken surface.....granular; dull silky spot  
 Elongation of inch sections.....".10, ".18, ".23, ".10

Hoop B<sub>6</sub>.

No. 3915.

Marks, <sup>12 M R<sub>2</sub> B<sub>3</sub></sup><sub>T, O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000200	.000200	0.	0.	
2,500	10,000	.000425	.000225	.....	.....	
5,000	20,000	.000700	.000275	.....	.....	
7,500	30,000	.001050	.000350	.....	.....	
10,000	40,000	.001425	.000375	.....	.....	
11,250	45,000	.001550	.000125	.000075	.000075	
12,500	50,000	.001775	.000225	.000075	0.	
12,750	51,000	.001800	.000025	.....	.....	
13,000	52,000	.001825	.000025	.....	.....	
13,250	53,000	.001875	.000050	.....	.....	
13,500	54,000	.001950	.000075	.....	.....	
13,750	55,000	.0020.5	.000075	.....	.....	
14,000	56,000	.002100	.000075	.....	.....	Elastic limit.
14,250	57,000	.002200	.000100	.....	.....	
14,500	58,000	.002375	.000175	.....	.....	
14,750	59,000	.002550	.000175	.....	.....	
15,000	60,000	.002875	.000325	.....	.....	
15,500	62,000	.004125	.001250	.....	.....	
16,000	64,000	.005750	.001625	.....	.....	
16,500	66,000	.007425	.001675	.....	.....	
17,000	68,000	.008950	.001525	.....	.....	
17,500	70,000	.010300	.001350	.....	.....	Tensile strength.
20,610	106,440	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 106,440  
 Elastic limit per square inch of original section.....do.. 57,000  
 Elongation per inch after rupture.....inch.. 0.1475  
 Elongation per inch under strain at elastic limit.....do.. .002200  
 Reduction in diameter at point of rupture.....do.. .094  
 Reduction in area after rupture, per centum of original section.....do.. 30.8  
 Position of rupture.....".50 from neck  
 Character of broken surface.....granular; silky eccentric spot  
 Elongation of inch sections.....".10, ".17, ".23, ".09

## GAS CHECK.

No. 3816.

Marks, <sup>12</sup> M R, G CDiameter, <sup>T, O</sup>  $\frac{1}{2}$  564.

Sectional area, .25 square inch.

Gauged length, 3'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000200	.000100	.....	.....	
7,500	30,000	.000867	.000667	.....	.....	
12,500	50,000	.001600	.000733	.....	.....	
15,000	60,000	.001933	.000333	0.	.....	
17,500	70,000	.002300	.000367	0.	.....	
17,750	71,000	.002300	0.	.....	.....	
18,000	72,000	.002333	.000033	.....	.....	
18,250	73,000	.002333	0.	.....	.....	Elastic limit.
18,500	74,000	.002367	.000034	.....	.....	
18,750	75,000	.002400	.000033	.....	.....	
19,000	76,000	.002633	.000233	.....	.....	
19,250	77,000	.002833	.000200	.....	.....	
19,500	78,000	.002933	.000100	.....	.....	
20,000	80,000	.003500	.000567	.....	.....	
20,500	82,000	.004333	.000833	.....	.....	
21,000	84,000	.005500	.001167	.....	.....	
21,500	86,000	.007000	.001500	.....	.....	Tensile strength.
22,000	88,000	.008600	.001600	.....	.....	
33,460	133,840	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 133,840  
 Elastic limit per square inch of original section ..... do... 75,000  
 Elongation per inch after rupture ..... inch... 0.1209  
 Elongation per inch under strain at elastic limit ..... do... 0.002400  
 Reduction in area after rupture ..... do... 0.064  
 Reduction in area after rupture, per centum of original section ..... 21.4  
 Position of rupture ..... 1" .25 from neck  
 Character of broken surface ..... granular; silky spot near the circumference  
 Elongation of inch sections ..... ".06, ".18\*, ".12

No. 3817.

Marks, <sup>12 M R G C</sup><sub>T<sub>4</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	-----	
2,500	10,000	.000333	.000166	-----	-----	
7,500	30,000	.000967	.000634	-----	-----	
12,500	50,000	.001600	.000633	-----	-----	
15,000	60,000	.001933	.000333	0.	-----	Elastic limit.
17,500	70,000	.002500	.000567	.000200	.000200	
17,750	71,000	.002633	.000133	-----	-----	
18,000	72,000	.002800	.000167	-----	-----	
18,250	73,000	.002967	.000167	-----	-----	
18,750	75,000	.003367	.000400	-----	-----	
19,250	77,000	.004167	.000800	-----	-----	
19,750	79,000	.005000	.000833	-----	-----	
20,250	81,000	.006033	.001033	-----	-----	
20,750	83,000	.007000	.000967	-----	-----	
32,420	129,680	-----	-----	-----	-----	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 129,680  
 Elastic limit per square inch of original section.....do... 70,003  
 Elongation per inch after rupture.....inch... 0.1033  
 Elongation per inch under strain at elastic limit.....do... .002500  
 Reduction in diameter at point of rupture.....do... .064  
 Reduction in area after rupture, per centum of original section.....21.4  
 Position of rupture.....".75 from neck  
 Character of broken surface.....granular, silky center  
 Elongation of inch sections.....".06, ".08, ".17

## 12-INCH B. L. MORTAR, NO. 3.

## TRUNNION HOOP.

No. 3824.

Marks, <sup>12 M R T H</sup><sub>T, O</sub>

Diameter, "564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000325	.000175	.....	.....	
5,000	20,000	.000675	.000350	.....	.....	
7,500	30,000	.001025	.000350	.....	.....	
10,000	40,000	.001375	.000350	.....	.....	
11,250	45,000	.001550	.000175	.000050	.000050	
12,000	48,000	.001725	.000175	.000075	.000025	
12,250	49,000	.001775	.000050	.....	.....	
12,500	50,000	.001800	.000025	.....	.....	
12,750	51,000	.001850	.000050	.....	.....	Elastic limit.
13,000	52,000	.001925	.000075	.....	.....	
13,250	53,000	.002000	.000075	.....	.....	
13,500	54,000	.002075	.000075	.....	.....	
13,750	55,000	.002200	.000125	.....	.....	
14,000	56,000	.002325	.000125	.....	.....	
14,250	57,000	.002475	.000150	.....	.....	
14,750	59,000	.002950	.000475	.....	.....	
15,250	61,000	.004175	.001225	.....	.....	
15,750	63,000	.005525	.001350	.....	.....	
16,250	65,000	.007050	.001525	.....	.....	Tensile strength.
16,750	67,000	.008625	.001575	.....	.....	
26,260	105,040	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section .....	pounds..	105,040
Elastic limit per square inch of original section .....	do.	54,000
Elongation per inch after rupture .....	inch..	0.1325
Elongation per inch under strain at elastic limit .....	do.	.002075
Reduction in diameter at point of rupture .....	do.	.074
Reduction in area after rupture, per centum of original section .....		24.6
Position of rupture .....	1". 10 from neck	
Character of broken surface .....	granular	
Elongation of inch sections .....	" 16*, " 18, " 11, " 09	

HOOP A<sub>4</sub>.

No. 3926.

Marks, <sup>12</sup>MR<sub>3</sub>A<sub>4</sub>  
<sub>T<sub>1</sub>O</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation. per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000150	.000150	0.		
2, 500	10, 000	.000300	.000150	.....	.....	
5, 000	20, 000	.000650	.000350	.....	.....	
7, 500	30, 000	.001000	.000350	.....	.....	
10, 000	40, 000	.001400	.000400	.....	.....	
11, 250	45, 000	.001525	.000125	p.		
12, 500	50, 000	.001700	.000175	0.		
12, 750	51, 000	.001750	.000050	.....	.....	
13, 000	52, 000	.001775	.000025	.....	.....	
13, 250	53, 000	.001825	.000050	.....	.....	
13, 500	54, 000	.001875	.000050	.....	.....	
13, 750	55, 000	.001925	.000050	.....	.....	
14, 000	56, 000	.001975	.000050	.....	.....	Elastic limit.
14, 250	57, 000	.002025	.000050	.....	.....	
14, 500	58, 000	.002150	.000125	.....	.....	
14, 750	59, 000	.002275	.000125	.....	.....	
15, 000	60, 000	.002525	.000250	.....	.....	
15, 500	62, 000	.003150	.000625	.....	.....	
16, 000	64, 000	.003950	.000800	.....	.....	
16, 500	66, 000	.005100	.001150	.....	.....	
17, 000	68, 000	.006450	.001350	.....	.....	
17, 500	70, 000	.007025	.001475	.....	.....	Tensile strength.
27, 800	111, 200	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 111, 200  
 Elastic limit per square inch of original section ..... do... 57, 000  
 Elongation per inch after rupture ..... inch... 0. 1275  
 Elongation per inch under strain at elastic limit ..... do... .002025  
 Reduction in diameter at point of rupture ..... do... .084  
 Reduction in area after rupture, per centum of original section ..... 27.6  
 Position of rupture ..... 1". 10 from neck  
 Character of broken surface ..... granular, silky center  
 Elongation of inch sections ..... ". 07, ". 08, ". 16, ". 20"



HOOP A<sub>5</sub>.

No. 3857.

Marks, 12 M R<sub>2</sub> A<sub>5</sub>Diameter,  $\frac{7}{16}$  564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000050	.000050	0.		
2,500	10,000	.000175	.000025			
5,000	20,000	.000525	.000350			
7,500	30,000	.000875	.000350			
10,000	40,000	.001250	.000375			
11,250	45,000	.001400	.000150	0.		
12,500	50,000	.001575	.000175	0.		
12,750	51,000	.001600	.000025			
13,000	52,000	.001625	.000025			
13,250	53,000	.001650	.000025			
13,500	54,000	.001725	.000075			
13,750	55,000	.001775	.000050			
14,000	56,000	.001800	.000025			
14,250	57,000	.001825	.000025			
14,500	58,000	.001875	.000050			Elastic limit.
14,750	59,000	.001950	.000075			
15,000	60,000	.002000	.000050			
15,250	61,000	.002100	.000100			
15,500	62,000	.002250	.000150			
15,750	63,000	.002625	.000375			
16,250	65,000	.003375	.000750			
16,750	67,000	.005875	.002500			
17,250	69,000	.007875	.002000			
17,750	71,000	.009750	.001875			
18,250	73,000	.001625	.001875			Tensile strength.
26,510	106,040					

## General summary.

Tensile strength per square inch of original section ..... pounds.. 106,040  
 Elastic limit per square inch of original section.....do..... 60,000  
 Elongation per inch after rupture.....inch..... 0.1725  
 Elongation per inch under strain at elastic limit.....do..... .002000  
 Reduction in diameter at point of rupture.....do..... .134  
 Reduction in area after rupture, per centum of original section..... 41.9  
 Position of rupture..... 2".20 from neck  
 Character of broken surface.....silky, interspersed with granular metal at the circumference  
 Elongation of inch sections.....".09, ".22, ".28, ".10

HOOP B<sub>1</sub>.

No. 3840.

Marks, <sup>12 M R<sub>3</sub> B<sub>1</sub></sup><sub>T<sub>2</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	.....	.....	
5,000	20,000	.000650	.000350	.....	.....	
7,500	30,000	.001000	.000350	.....	.....	
10,000	40,000	.001375	.000375	.....	.....	
11,250	45,000	.001525	.000150	0.	.....	
12,500	50,000	.001750	.000225	0.	.....	
12,750	51,000	.001800	.000050	.....	.....	
13,000	52,000	.001825	.000025	.....	.....	Elastic limit.
13,250	53,000	.001850	.000025	.....	.....	
13,500	54,000	.001900	.000050	.....	.....	
13,750	55,000	.001900	0.	.....	.....	
14,000	56,000	.002000	.000100	.....	.....	
14,250	57,000	.002025	.000025	.....	.....	
14,500	58,000	.002150	.000125	.....	.....	
14,750	59,000	.002250	.000100	.....	.....	
15,000	60,000	.002350	.000100	.....	.....	
15,500	62,000	.002625	.000275	.....	.....	
16,000	64,000	.003200	.000575	.....	.....	Tensile strength.
16,500	66,000	.004950	.001750	.....	.....	
17,000	68,000	.008750	.001800	.....	.....	
17,500	70,000	.008525	.001775	.....	.....	
27,040	108,160	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds ..	108,160
Elastic limit per square inch of original section.....	do ..	57,000
Elongation per inch after rupture.....	inch ..	0.1575
Elongation per inch under strain at elastic limit.....	do ..	.002025
Reduction in diameter at point of rupture.....	do ..	0.104
Reduction in area after rupture, per centum of original section.....		33.5
Position of rupture.....	2" from neck	
Character of broken surface.....	granular at circumference 60 per cent.; silky center	
Elongation of inch sections.....	"10," "28," "14," "11	

HOOP B<sub>3</sub>.

No. 3927.

Marks, <sup>12 M R<sub>3</sub> B<sub>3</sub></sup><sub>T<sub>1</sub> O</sub>Diameter, <sup>1</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000275	.000175	.....	.....	
5,000	20,000	.000575	.000300	.....	.....	
7,500	30,000	.000975	.000400	.....	.....	
10,000	40,000	.001275	.000300	.....	.....	
11,250	45,000	.001450	.000175	0.	.....	
12,500	50,000	.001700	.000250	0.	.....	
12,750	51,000	.001725	.000025	.....	.....	
13,000	52,000	.001750	.000025	.....	.....	
13,250	53,000	.001825	.000075	.....	.....	Elastic limit.
13,500	54,000	.001975	.000150	.....	.....	
13,750	55,000	.002125	.000150	.....	.....	
14,000	56,000	.002300	.000175	.....	.....	
14,500	58,000	.002850	.000550	.....	.....	
15,000	60,000	.003875	.001025	.....	.....	
15,500	62,000	.005175	.001300	.....	.....	
16,000	64,000	.006525	.000350	.....	.....	
16,500	66,000	.008000	.001475	.....	.....	
27,090	108,360	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 108,360  
 Elastic limit per square inch of original section.....do.. 53,000  
 Elongation per inch after rupture.....inch.. 0.1500  
 Elongation per inch under strain at elastic limit.....do.. .001825  
 Reduction in diameter at point of rupture.....do... .084  
 Reduction in area after rupture, per centum of original section.....27.6  
 Position of rupture.....1".30 from neck  
 Character of broken surface.....granular, silky center  
 Elongation of inch sections.....".17, ".22", ".11, ".10

## 12-INCH B. L. MORTAR, NO. 4.

HOOP A<sub>3</sub>.

No. 3876.

Marks, 12 M R<sub>4</sub> A<sub>3</sub>  
T, O

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.		
2,500	10,000	.000250	.000125			
5,000	20,000	.000525	.000275			
7,500	30,000	.000825	.000300			
10,000	40,000	.001125	.000300			
11,250	45,000	.001325	.000200	0.		
12,500	50,000	.001525	.000200	0.		
12,750	51,000	.001550	.000025			
13,000	52,000	.001575	.000025			
13,250	53,000	.001625	.000050			Elastic limit.
13,500	54,000	.001675	.000050			
13,750	55,000	.001725	.000050			
14,000	56,000	.001775	.000050			
14,250	57,000	.001825	.000050			
14,500	58,000	.001875	.000050			
14,750	59,000	.001925	.000050			
15,000	60,000	.002050	.000125			
15,250	61,000	.002175	.000125			
15,500	62,000	.002450	.000275			
16,000	64,000	.003625	.001175			Tensile strength.
16,500	66,000	.005075	.001450			
17,000	68,000	.007000	.001925			
17,500	70,000	.008025	.001625			
18,000	72,000	.010250	.001625			
26,980	107,920					

## General summary.

Tensile strength per square inch of original section.....pounds.. 107,920  
 Elastic limit per square inch of original section.....do... 59,000  
 Elongation per inch after rupture.....inch... 0.1400  
 Elongation per inch under strain at elastic limit.....do... .001925  
 Reduction in diameter at point of rupture.....do... .084  
 Reduction in area after rupture, per centum of original section..... 27.6  
 Position of rupture.....1".50 from neck  
 Character of broken surface.....granular, dull silky center  
 Elongation of inch sections.....".09, ".12, ".23, ".12

HOOP A<sub>4</sub>.

No. 3879.

Marks, <sup>12 M R<sub>4</sub> A<sub>4</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000350	.000225	.....	.....	
5,000	20,000	.000750	.000400	.....	.....	
7,500	30,000	.001100	.000350	.....	.....	
10,000	40,000	.001450	.000350	.....	.....	
11,250	45,000	.001600	.000150	.000075	.000075	
12,500	50,000	.001775	.000175	.000075	0.	
12,750	51,000	.001800	.000025	.....	.....	
13,000	52,000	.001850	.000050	.....	.....	
13,250	53,000	.001900	.000050	.....	.....	
13,500	54,000	.001925	.000025	.....	.....	
13,750	55,000	.001975	.000050	.....	.....	
14,000	56,000	.002050	.000075	.....	.....	Elastic limit.
14,250	57,000	.002125	.000075	.....	.....	
14,500	58,000	.002200	.000075	.....	.....	
14,750	59,000	.002250	.000050	.....	.....	
15,000	60,000	.002450	.000200	.....	.....	
15,250	61,000	.002650	.000200	.....	.....	
15,500	62,000	.003150	.000500	.....	.....	
16,000	64,000	.004250	.001100	.....	.....	
16,500	66,000	.006100	.001850	.....	.....	
17,000	68,000	.008025	.001925	.....	.....	
17,500	70,000	.009750	.001725	.....	.....	Tensile strength.
18,000	72,000	.011250	.001500	.....	.....	
26,890	107,560	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 107,560  
 Elastic limit per square inch of original section ..... do.. 59,000  
 Elongation per inch after rupture ..... inch.. 0.1550  
 Elongation per inch under strain at elastic limit ..... do.. .002250  
 Reduction in diameter at point of rupture ..... do.. .104  
 Reduction in area after rupture, per centum of original section ..... 33.5  
 Position of rupture ..... 2" from neck  
 Character of broken surface ..... granular, silky center  
 Elongation of inch sections ..... ".09, ".28\*, ".15, ".10

Hoop B<sub>4</sub>.

No. 3882.

Marks, 12 M R<sub>4</sub> B<sub>4</sub>  
T<sub>1</sub> O

Diameter, 11.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.	0.	
2,500	10,000	.000200	.000125	.....	.....	
5,000	20,000	.000500	.000300	.....	.....	
7,500	30,000	.000850	.000350	.....	.....	
10,000	40,000	.001200	.000350	.....	.....	
11,250	45,000	.001325	.000125	0.	.....	
12,500	50,000	.001500	.000175	0.	.....	
12,750	51,000	.001550	.000050	.....	.....	
13,000	52,000	.001600	.000050	.....	.....	
13,250	53,000	.001650	.000050	.....	.....	
13,500	54,000	.001700	.000050	.....	.....	
13,750	55,000	.001750	.000050	.....	.....	
14,000	56,000	.001825	.000075	.....	.....	Elastic limit.
14,250	57,000	.001900	.000075	.....	.....	
14,500	58,000	.002025	.000125	.....	.....	
14,750	59,000	.002150	.000125	.....	.....	
15,000	60,000	.002450	.000300	.....	.....	
15,500	62,000	.003700	.001250	.....	.....	
16,000	64,000	.005400	.001700	.....	.....	
16,500	66,000	.007375	.001975	.....	.....	
17,000	68,000	.008875	.001500	.....	.....	
17,500	70,000	.010625	.001750	.....	.....	Tensile strength.
25,980	103,920	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 103,920  
 Elastic limit per square inch of original section ..... do... 57,000  
 Elongation per inch after rupture ..... inch... 0.1725  
 Elongation per inch under strain at elastic limit ..... do... .001900  
 Reduction in diameter at point of rupture ..... do... 0.114  
 Reduction in area after rupture, per centum of original section ..... 36.4  
 Position of rupture ..... ".15 from neck  
 Character of broken surface..... silky, interspersed with granular metal at the circumference  
 Elongation of inch sections ..... ".10, ".30\*, ".18, ".11

HOOP B<sub>5</sub>.

No. 3877.

Marks, <sup>12</sup>M R<sub>4</sub> B<sub>5</sub>Diameter <sup>T<sub>1</sub>O</sup> ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000075	.000075	0.	0.	
2,500	10,000	.000250	.000175	.....	.....	
5,000	20,000	.000575	.000325	.....	.....	
7,500	30,000	.000900	.000325	.....	.....	
10,000	40,000	.001225	.000325	.....	.....	
11,250	45,000	.001400	.000175	.000050	.000050	
12,500	50,000	.001575	.000175	.000050	0.	
12,750	51,000	.001600	.000025	.....	.....	
13,000	52,000	.001650	.000050	.....	.....	
13,250	53,000	.001675	.000025	.....	.....	
13,500	54,000	.001700	.000025	.....	.....	
13,750	55,000	.001725	.000025	.....	.....	
14,000	56,000	.001775	.000050	.....	.....	
14,250	57,000	.001825	.000050	.....	.....	
14,500	58,000	.001825	0.	.....	.....	
14,750	59,000	.001875	.000050	.....	.....	
15,000	60,000	.001925	.000050	.....	.....	
15,250	61,000	.002000	.000075	.....	.....	Elastic limit.
15,500	62,000	.002125	.000125	.....	.....	
15,750	63,000	.002250	.000125	.....	.....	
16,000	64,000	.002500	.000250	.....	.....	
16,500	66,000	.003500	.001000	.....	.....	
17,000	68,000	.005375	.001875	.....	.....	
17,500	70,000	.007325	.001950	.....	.....	
18,000	72,000	.009000	.001675	.....	.....	
18,500	74,000	.010750	.001750	.....	.....	
27,190	108,760	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 108,760  
 Elastic limit per square inch of original section.....do... 61,000  
 Elongation per inch after rupture.....inch... .1525  
 Elongation per inch under strain at elastic limit.....do... .002000  
 Reduction in diameter at point of rupture.....do... .104  
 Reduction in area after rupture, per centum of original section.....do... 33.5  
 Position of rupture.....2" from neck  
 Character of broken surface.....granular; silky center  
 Elongation of inch sections.....".08, ".14, ".27\*, ".37

H. Ex. 165—25

## TRUNNION HOOP.

No. 3875.

Marks, <sup>12 M R T H</sup><sub>T O</sub>Diameter, <sup>1</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000075	.000075	0.	.....	
2,500	10,000	.000225	.000150	.....	.....	
5,000	20,000	.000575	.000350	.....	.....	
7,500	30,000	.000975	.000400	.....	.....	
10,000	40,000	.001225	.000250	.....	.....	
11,250	45,000	.001350	.000125	0.	.....	
12,000	48,000	.001475	.000125	0.	.....	
12,500	50,000	.001575	.000100	.....	.....	
12,750	51,000	.001600	.000025	.....	.....	
13,000	52,000	.001625	.000025	.....	.....	
13,250	53,000	.001675	.000050	.....	.....	
13,500	54,000	.001700	.000025	.....	.....	
13,750	55,000	.001725	.000025	.....	.....	
14,000	56,000	.001800	.000075	.....	.....	
14,250	57,000	.001825	.000025	.....	.....	
14,500	58,000	.001875	.000050	.....	.....	
14,750	59,000	.001975	.000100	.....	.....	Elastic limit not well defined.
15,000	60,000	.002050	.000075	.....	.....	
15,250	61,000	.002150	.000100	.....	.....	
15,500	62,000	.002375	.000225	.....	.....	
16,000	64,000	.003400	.001025	.....	.....	
16,500	66,000	.005300	.001900	.....	.....	
17,000	68,000	.006825	.001525	.....	.....	
17,500	70,000	.008825	.002000	.....	.....	
18,000	72,000	.010700	.001875	.....	.....	
26,580	106,320	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	106,320
Elastic limit per square inch of original section, not well defined.....	do..	58,060
Elongation per inch after rupture.....	inch..	0.1525
Elongation per inch under strain at elastic limit.....	do..	.001875
Reduction in diameter at point of rupture.....	do..	.104
Reduction in area after rupture, per centum of original section.....		38.5
Position of rupture.....	2" 20 from neck	
Character of broken surface.....	granular; silky center.	
Elongation of inch sections.....	" .08, " .15, " 27", " .11	



## GAS CHECK.

No. 3880.

Marks,  $12 M R_4 G C$   
 $T_5 O$ 

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000367	.000200	.....	.....	
7,500	30,000	.001033	.000666	.....	.....	
12,500	50,000	.001733	.000700	.....	.....	
15,000	60,000	.002067	.000334	.000067	.000067	
17,500	70,000	.002500	.000433	.000133	.000066	
17,750	71,000	.002567	.000067	.....	.....	
18,000	72,000	.002600	.000033	.....	.....	
18,250	73,000	.002633	.000033	.....	.....	
18,500	74,000	.002700	.000067	.....	.....	
18,750	75,000	.002767	.000067	.....	.....	
19,000	76,000	.002867	.000100	.....	.....	Elastic limit not well defined.
19,250	77,000	.002967	.000100	.....	.....	
19,500	78,000	.003100	.000133	.....	.....	
19,750	79,000	.003233	.000133	.....	.....	
20,000	80,000	.003433	.000200	.....	.....	
20,250	81,000	.003567	.000134	.....	.....	
20,500	82,000	.003800	.000233	.....	.....	
20,750	83,000	.004133	.000333	.....	.....	
21,000	84,000	.004400	.000267	.....	.....	
21,500	86,000	.005100	.000700	.....	.....	
22,000	88,000	.006133	.001033	.....	.....	Tensile strength.
22,500	90,000	.007200	.001067	.....	.....	
34,520	138,080	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 138,080  
 Elastic limit per square inch of original section, not well defined.....do... 75,000  
 Elongation per inch after rupture.....inch... .1233  
 Elongation per inch under strain at elastic limit.....do... .002767  
 Reduction in diameter at point of rupture.....do... .054  
 Reduction in area after rupture, per centum of original section.....do... 18.3  
 Position of rupture.....".75 from neck  
 Character of broken surface.....granular; dull spot at the circumference  
 Elongation of inch sections.....".14", ".07", ".06

No. 3881.

Marks, <sup>12 M R<sub>4</sub> G C</sup>  
<sub>T<sub>3</sub> M</sub>Diameter, <sup>11</sup>/<sub>16</sub> .564.

Sectional area, .25 square inch.

Gauged length, 3'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	0.	
2,500	10,000	.000333	.000200	.....	.....	
7,500	30,000	.001000	.000667	.....	.....	
12,500	50,000	.001767	.000767	.....	.....	
15,000	60,000	.002067	.000300	.000067	.000067	Elastic limit below 70,000 pounds per square inch.
17,500	70,000	.002900	.000833	.000400	.000333	
17,750	71,000	.003067	.000167	.....	.....	
18,000	72,000	.003233	.000166	.....	.....	
18,250	73,000	.003467	.000234	.....	.....	
18,500	74,000	.003700	.000233	.....	.....	
19,000	76,000	.004467	.000767	.....	.....	
19,500	78,000	.005333	.000866	.....	.....	
20,000	80,000	.006333	.001000	.....	.....	
20,500	82,000	.007253	.000900	.....	.....	
21,000	84,000	.008500	.001267	.....	.....	Tensile strength.
33,020	132,080	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 132,080  
 Elongation per inch after rupture.....inch.. .0933  
 Reduction in diameter at point of rupture.....do... .054  
 Reduction in area after rupture, per centum of original section..... 18.3  
 Position of rupture..... 1' .50 from neck  
 Character of broken surface..... granular; dull spot at the circumference  
 Elongation of inch sections.....".06, ".15, ".07

## 12-INCH B. L. MORTAR, NO. 5.

HOOP A<sub>4</sub>.

No. 3899.

Marks, <sup>12 M R<sub>5</sub> A<sub>4</sub></sup>  
<sub>T<sub>3</sub> I</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000250	.000100	0.	.....	
5,000	20,000	.000625	.000375	.....	.....	
7,500	30,000	.000925	.000300	.....	.....	
10,000	40,000	.001250	.000325	.....	.....	
11,250	45,000	.001425	.000175	0.	.....	
12,500	50,000	.001625	.000200	0.	.....	
12,750	51,000	.001650	.000025	.....	.....	
15,000	52,000	.001675	.000025	.....	.....	
13,250	53,000	.001700	.000025	.....	.....	Elastic limit.
13,500	54,000	.001725	.000025	.....	.....	
13,750	55,000	.001850	.000025	.....	.....	
14,000	56,000	.001975	.000125	.....	.....	
14,250	57,000	.002200	.000225	.....	.....	
14,750	59,000	.002675	.000475	.....	.....	
15,250	61,000	.004250	.001575	.....	.....	
15,750	63,000	.006450	.002200	.....	.....	
16,250	65,000	.008625	.002175	.....	.....	
16,750	67,000	.010500	.001875	.....	.....	
24,880	99,520	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	99,520
Elastic limit per square inch of original section .....	do..	54,000
Elongation per inch after rupture .....	inch..	.1650
Elongation per inch under strain at elastic limit .....	do..	.001725
Reduction in diameter at point of rupture .....	do..	.114
Reduction in area after rupture, per centum of original section .....		36.4
Position of rupture .....	1" 85 from neck	
Character of broken surface .....	granular, silky center	
Elongation of inch sections .....	" 08, " 14, " 83, " 1	

## HOOP A.

No. 3975.

Marks, <sup>12 M R<sub>5</sub> A<sub>6</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	— .000050	— .000050	
2,500	10,000	.000175	.000175	— .000050	— .000050	
5,000	20,000	.000450	.000275	— .000050	— .000050	
7,500	30,000	.000775	.000325	— .000050	— .000050	
10,000	40,000	.001075	.000300	— .000050	— .000050	
11,250	45,000	.001275	.000200	— .000075	— .000025	
12,500	50,000	.001500	.000225	— .000075	0.	
12,750	51,000	.001550	.000050	— .000050	— .000050	
13,000	52,000	.001575	.000025	— .000025	— .000025	
13,250	53,000	.001600	.000025	— .000025	— .000025	
13,500	54,000	.001650	.000050	— .000050	— .000050	
13,750	55,000	.001700	.000050	— .000050	— .000050	
14,000	56,000	.001775	.000075	— .000075	— .000075	
14,250	57,000	.001800	.000025	— .000025	— .000025	Elastic limit.
14,500	58,000	.001900	.000100	— .000100	— .000100	
14,750	59,000	.002000	.000100	— .000100	— .000100	
15,000	60,000	.002175	.000175	— .000175	— .000175	
15,500	62,000	.003375	.001200	— .001200	— .001200	
16,000	64,000	.005000	.001625	— .001625	— .001625	
16,500	66,000	.007375	.002375	— .002375	— .002375	
17,000	68,000	.009200	.001825	— .001825	— .001825	
17,500	70,000	.011375	.002175	— .002175	— .002175	
25,290	101,160	— .011375	— .002175	— .002175	— .002175	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....	pounds..	101,160
Elastic limit per square inch of original section.....	do..	57,000
Elongation per inch after rupture.....	inch.	0.1625
Elongation per inch under strain at elastic limit.....	do..	.001800
Reduction in diameter at point of rupture.....	do..	.134
Reduction in area after rupture, per centum of original section.....		41.9
Position of rupture.....		1".50 from neck
Character of broken surface.....	silky, in part interspersed with granular metal	
Elongation of inch sections.....	"14,"32*,"10,"09	

HOOP B<sub>5</sub>.

No. 3922.

Marks, <sup>12 M R<sub>5</sub> B<sub>5</sub></sup><sub>T, O.</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000300	.000200			
5,000	20,000	.000675	.000375			
7,500	30,000	.001000	.000325			
10,000	40,000	.001375	.000375			
11,250	45,000	.001525	.000150	.000025	.000025	
12,500	50,000	.001700	.000175	.000025	0.	
12,750	51,000	.001750	.000050			
13,000	52,000	.001775	.000025			
13,250	53,000	.001825	.000050			Elastic limit.
13,500	54,000	.001850	.000025			
13,750	55,000	.001900	.000050			
14,000	56,000	.001925	.000025			
14,250	57,000	.001975	.000050			
14,500	58,000	.002025	.000050			
14,750	59,000	.002125	.000100			
15,000	60,000	.002225	.000100			
15,250	61,000	.002350	.000125			
15,750	63,000	.002825	.000475			
16,250	65,000	.004375	.001550			Tensile strength.
16,750	67,000	.005750	.001375			
17,250	69,000	.007450	.001700			
17,750	71,000	.009500	.002050			
27,070	108,280					

## General summary.

Tensile strength per square inch of original section.....pounds.. 108,280  
 Elastic limit per square inch of original section.....do... 58,000  
 Elongation per inch after rupture.....inch... .17  
 Elongation per inch under strain at elastic limit.....do... .002025  
 Reduction in diameter at point of rupture.....do... .104  
 Reduction in area after rupture, per centum of original section.....33.5  
 Position of rupture.....1".70 from neck  
 Character of broken surface.....granular, silky center  
 Elongation of inch sections.....".13, ".31\*, ".14, ".10

## TRUNNION HOOP.

No. 3923.

Marks, <sup>12 M R<sub>5</sub> T H</sup><sub>T<sub>1</sub> O</sub>Diameter, <sup>11</sup>/<sub>16</sub> 564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	0.	0.	
5,000	20,000	.000500	.000300	0.	0.	
7,500	30,000	.000925	.000325	0.	0.	
10,000	40,000	.001300	.000375	0.	0.	
11,250	45,000	.001425	.000125	0.	0.	
12,000	48,000	.001550	.000125	0.	0.	
12,250	49,000	.001575	.000025	0.	0.	
12,500	50,000	.001600	.000025	0.	0.	
12,750	51,000	.001650	.000050	0.	0.	Elastic limit.
13,000	52,000	.001700	.000050	0.	0.	
13,250	53,000	.001750	.000050	0.	0.	
13,500	54,000	.001800	.000050	0.	0.	
13,750	55,000	.001850	.000050	0.	0.	
14,000	56,000	.001950	.000100	0.	0.	
14,250	57,000	.002100	.000150	0.	0.	
14,500	58,000	.002275	.000175	0.	0.	
15,000	60,000	.003100	.000825	0.	0.	
15,500	62,000	.005000	.001900	0.	0.	
16,000	64,000	.007250	.002250	0.	0.	Tensile strength.
16,500	66,000	.009350	.002100	0.	0.	
17,000	68,000	.010750	.001400	0.	0.	
24,980	99,920	-----	-----	-----	-----	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 99,920  
 Elastic limit per square inch of original section ..... do... 55,000  
 Elongation per inch after rupture ..... inch.. .1725  
 Elongation per inch under strain at elastic limit ..... do... .001850  
 Reduction in diameter at point of rupture ..... do... .134  
 Reduction in area after rupture, per centum of original section ..... 41.9  
 Position of rupture ..... 1 1/2 from neck  
 Character of broken surface ..... silky, in part interspersed with granular metal

## 12-INCH B. L. MORTAR, NO. 6.

HOOP A<sub>4</sub>.

No. 3974.

Marks, <sup>12 M R, A<sub>4</sub></sup><sub>T<sub>1</sub> C</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000025	.000025	0.	0.	
2,500	10,000	.000175	.000150			
5,000	20,000	.000475	.000300			
7,500	30,000	.000800	.000325			
10,000	40,000	.001150	.000350			
11,250	45,000	.001275	.000125	.000025	.000025	
12,500	50,000	.001450	.000175	.000050	.000075	
12,750	51,000	.001500	.000050			
13,000	52,000	.001550	.000050			
13,250	53,000	.001600	.000050			
13,500	54,000	.001650	.000050			
13,750	55,000	.001700	.000050			
14,000	56,000	.001775	.000075			
14,250	57,000	.001850	.000075			Elastic limit.
14,500	58,000	.001975	.000125			
14,750	59,000	.002100	.000125			
15,000	60,000	.002325	.000325			
15,250	61,000	.003500	.000575			
15,500	62,000	.005175	.001675			
16,000	64,000	.007300	.002125			
16,500	66,000	.008875	.001575			
17,000	68,000	.010950	.002075			
17,500	70,000	.012375	.001425			
18,000	72,000	.014400	.002025			Tensile strength.
25,510	102,040					

## General summary.

Tensile strength per square inch of original section ..... pounds.. 102,040  
 Elastic limit per square inch of original section ..... do... 59,000  
 Elongation per inch after rupture ..... inch.. .1775  
 Elongation per inch under strain at elastic limit ..... do... .002100  
 Reduction in diameter at point of rupture ..... do... .144  
 Reduction in area after rupture, per centum of original section ..... 44.6  
 Position of rupture ..... 1" .20 from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".09, ".12, ".21, ".26

HOOP B<sub>4</sub>.

No. 3916.

Marks, <sup>12 M R<sub>6</sub> B<sub>4</sub></sup>  
<sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000175	.000175	0.	0.	
2,500	10,000	.000450	.000275	0.	0.	
5,000	20,000	.000750	.000300	0.	0.	
7,500	30,000	.001175	.000425	0.	0.	
10,000	40,000	.001525	.000350	0.	0.	
11,250	45,000	.001700	.000175	.000050	.000050	
12,500	50,000	.001800	.000100	.000050	0.	
12,750	51,000	.001850	.000050	0.	0.	
13,000	52,000	.001900	.000050	0.	0.	
13,250	53,000	.001950	.000050	0.	0.	
13,500	54,000	.001975	.000025	0.	0.	
13,750	55,000	.002025	.000050	0.	0.	
14,000	56,000	.002050	.000025	0.	0.	
14,250	57,000	.002100	.000050	0.	0.	
14,500	58,000	.002150	.000050	0.	0.	
14,750	59,000	.002225	.000075	0.	0.	
15,000	60,000	.002300	.000075	0.	0.	Elastic limit.
15,250	61,000	.002450	.000150	0.	0.	
15,500	62,000	.003000	.000550	0.	0.	
15,750	63,000	.003425	.000425	0.	0.	
16,250	65,000	.005500	.002075	0.	0.	
16,750	67,000	.007875	.002375	0.	0.	
17,250	69,000	.009750	.001875	0.	0.	
17,750	71,000	.011500	.001750	0.	0.	
18,250	73,000	.013750	.002250	0.	0.	
26,070	104,280	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	104,280
Elastic limit per square inch of original section .....	do..	60,000
Elongation per inch after rupture .....	inch..	.180
Elongation per inch under strain at elastic limit .....	do..	.002300
Reduction in diameter at point of rupture .....	do..	.124
Reduction in area after rupture, per centum of original section .....		39.2
Position of rupture .....	2" from neck	
Character of broken surface .....	silky; interspersed with granular metal	
Elongation of inch sections .....	"10, "17, "35", "10	



## GAS CHECK.

No. 3841.

Marks, <sup>12 M R<sub>6</sub> G C</sup><sub>T<sub>2</sub> O</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	0.	
2,500	10,000	.000137	.000100	-----	-----	
7,500	30,000	.000800	.000633	-----	-----	
12,500	50,000	.001457	.000667	0.	-----	
15,000	60,000	.001800	.000333	0.	-----	
17,500	70,000	.002267	.000467	0.	-----	
17,750	71,000	.002367	.000100	-----	-----	
18,000	72,000	.002367	0.	-----	-----	
18,250	73,000	.002400	.000033	-----	-----	
18,500	74,000	.002467	.000067	-----	-----	
18,750	75,000	.002567	.000100	-----	-----	
19,000	76,000	.002667	.000100	-----	-----	
19,250	77,000	.002800	.000133	-----	-----	Elastic limit not well defined.
19,500	78,000	.003033	.000233	-----	-----	
19,750	79,000	.003367	.000334	-----	-----	
20,250	81,000	.004087	.000700	-----	-----	
20,750	83,000	.005000	.000933	-----	-----	
21,250	85,000	.006133	.001133	-----	-----	Tensile strength.
21,750	87,000	.007333	.001200	-----	-----	
22,250	89,000	.008333	.001000	-----	-----	
33,200	132,800	-----	-----	-----	-----	

## General summary.

Tensile strength per square inch of original section.....pounds.. 132,800  
 Elastic limit per square inch of original section, not well defined.....do... 76,000  
 Elongation per inch after rupture.....inch... 0.1333  
 Elongation per inch under strain at elastic limit.....do... .002667  
 Reduction in diameter at point of rupture.....do... .064  
 Reduction in area after rupture, per centum of original section.....do... 27.6  
 Position of rupture.....at middle of stem  
 Character of broken surface.....granular, dull spot at the circumference  
 Elongation of inch sections.....".09, ".22\*, ".09

No. 3842.

Marks, <sup>12</sup> M R<sub>6</sub> G CDiameter, <sup>11</sup> .564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000967	.000087	0.	.....	
2,500	10,000	.000200	.000133	.....	.....	
7,500	30,000	.000867	.000667	.....	.....	
12,500	50,000	.001567	.000700	.....	.....	
15,000	60,000	.001887	.000300	0.	.....	Elastic limit below 70,000 pounds per inch.
17,500	70,000	.003100	.001233	.000567	.000567	
17,750	71,000	.003467	.000367	.....	.....	
18,000	72,000	.003767	.000300	.....	.....	
18,250	73,000	.004167	.000400	.....	.....	
18,750	75,000	.005167	.001000	.....	.....	
19,250	77,000	.006333	.001166	.....	.....	
19,750	79,000	.007400	.001067	.....	.....	
20,250	81,000	.008500	.001100	.....	.....	
20,750	83,000	.010000	.001300	.....	.....	
31,610	126,440					Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 126,440  
 Elongation per inch after rupture..... inch.. 0.1300  
 Reduction in diameter at point of rupture..... do... .074  
 Reduction in area after rupture, per centum of original section..... 24.6  
 Position of rupture..... ".90 from neck  
 Character of broken surface..... granular, silky center  
 Elongation of inch sections..... ".18, ".11, ".10

## 12-INCH B. L. MORTAR, NO. 7.

HOOP A<sub>8</sub>.

No. 4040.

Marks, <sup>12 M R A<sub>8</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.		
2,500	10,000	.000325	.000200			
5,000	20,000	.000700	.000375			
7,500	30,000	.001025	.000325			
10,000	40,000	.001400	.000375			
11,250	45,000	.001550	.000150	0.		
12,500	50,000	.001725	.000175	0.		
12,750	51,000	.001775	.000050			
13,000	52,000	.001800	.000025			
13,250	53,000	.001825	.000025			
13,500	54,000	.001900	.000075			
13,750	55,000	.001950	.000050			
14,000	56,000	.002000	.000050			
14,250	57,000	.002025	.000025			Elastic limit.
14,500	58,000	.002100	.000075			
14,750	59,000	.002175	.000075			
15,000	60,000	.002250	.000075			
15,250	61,000	.002375	.000125			
15,500	62,000	.002525	.000150			
15,750	63,000	.002725	.000200			
16,250	65,000	.003750	.001025			
16,750	67,000	.005625	.001875			
17,250	69,000	.007250	.001625			
17,750	71,000	.009250	.002000			Tensile strength.
18,250	73,000	.011000	.001750			
27,290	109,160					

## General summary.

Specific gravity.....	7.8425
Hardness.....	22.77
Tensile strength per square inch of original section.....	pounds.. 109,160
Elastic limit per square inch of original section.....	do... 60,000
Elongation per inch after rupture.....	inch... .1600
Elongation per inch under strain at elastic limit.....	do... .002250
Reduction in diameter at point of rupture.....	do... .094
Reduction in area after rupture, per centum of original section.....	30.6
Position of rupture.....	1".50 from neck
Character of broken surface.....	granular, silky center
Elongation of inch sections.....	".09, ".14, ".28, ".13

HOOP B<sub>3</sub>.

No. 4076.

Marks, <sup>12 M B<sub>3</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000275	.000175	.....	.....	
5,000	20,000	.000625	.000350	.....	.....	
7,500	30,000	.000950	.000325	.....	.....	
10,000	40,000	.001275	.000325	.....	.....	
11,250	45,000	.001450	.000175	0.	.....	
12,500	50,000	.001625	.000175	.....	.....	
12,750	51,000	.001650	.000025	.....	.....	
13,000	52,000	.001700	.000050	.....	.....	
13,250	53,000	.001725	.000025	.....	.....	
13,500	54,000	.001750	.000025	.....	.....	
13,750	55,000	.001775	.000025	.....	.....	
14,000	56,000	.001800	.000025	.....	.....	
14,250	57,000	.001850	.000050	.....	.....	
14,500	58,000	.001900	.000050	.....	.....	
14,750	59,000	.001950	.000050	.....	.....	
15,000	60,000	.002000	.000050	.....	.....	
15,250	61,000	.00 025	.000025	.....	.....	
15,500	62,000	.002075	.000050	.....	.....	Elastic limit.
15,750	63,000	.002125	.00 050	.....	.....	
16,000	64,000	.002275	.000150	.....	.....	
16,250	65,000	.00 400	.000125	.....	.....	
16,500	66,000	.002575	.000175	.....	.....	
17,000	68,000	.003625	.001050	.....	.....	
17,500	70,000	.005500	.001875	.....	.....	
18,000	72,000	.007500	.002000	.....	.....	
18,500	74,000	.009500	.002000	.....	.....	
19,000	76,000	.011200	.001700	.....	.....	Tensile strength.
27,500	110,360	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 110,360  
 Elastic limit per square inch of original section ..... do... 63,000  
 Elongation per inch after rupture ..... inch... .1375  
 Elongation per inch under strain at elastic limit ..... do... .002125  
 Reduction in diameter at point of rupture ..... do... .084  
 Reduction in area after rupture, per centum of original section ..... 27.6  
 Position of rupture ..... 1". 15 from neck  
 Character of broken surface ..... granular dull spot at circumference  
 Elongation of inch sections ..... ". 17, ". 18, ". 11, ". 09

## 12-INCH B. L. MORTAR, NO. 8.

HOOP B<sub>1</sub>.

No. 4145.

Marks,  $12 \frac{M}{T} R_3 B_1$ 

Diameter, 11.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	.....	.....	
5,000	20,000	.000675	.000375	.....	.....	
7,500	30,000	.001025	.000350	.....	.....	
10,000	40,000	.001325	.000300	.....	.....	
11,250	45,000	.001525	.000200	.....	.....	
12,500	50,000	.001725	.000200	.000025	.000025	
12,750	51,000	.001775	.000050	.....	.....	Elastic limit.
13,000	52,000	.001950	.000175	.....	.....	
13,250	53,000	.002125	.000175	.....	.....	
13,500	54,000	.002325	.000200	.....	.....	
14,000	56,000	.003025	.000700	.....	.....	
14,500	58,000	.003675	.000650	.....	.....	
15,000	60,000	.004950	.001275	.....	.....	
15,500	62,000	.006000	.001050	.....	.....	
16,000	64,000	.008650	.002650	.....	.....	
26,820	107,280	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 107,280  
 Elastic limit per square inch of original section ..... do... 51,000  
 Elongation per inch after rupture..... inch... .1500  
 Elongation per inch under strain at elastic limit..... do... .001775  
 Reduction in diameter at point of rupture..... .084  
 Reduction in area after rupture, per centum of original section..... 27.6  
 Position of rupture ..... "1.80. from neck  
 Character of broken surface..... granular, radiating from a dull spot at circumference  
 Elongation of inch sections..... "10, "14, "25, "11

HOOP B<sub>5</sub>.

No. 4147.

Marks, <sup>12 M B<sub>5</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000225	.000125	.....	.....	
5,000	20,000	.000550	.000325	.....	.....	
7,500	30,000	.000900	.000350	.....	.....	
10,000	40,000	.001275	.000375	.....	.....	
11,250	45,000	.001425	.000150	— .000025	— .000025	
12,500	50,000	.001625	.000200	0.	.000025	
12,750	51,000	.001650	.000025	.....	.....	
13,000	52,000	.001675	.000025	.....	.....	
13,250	53,000	.001725	.000050	.....	.....	
13,500	54,000	.001775	.000050	.....	.....	
13,750	55,000	.001800	.000025	.....	.....	Elastic limit.
14,000	56,000	.001900	.000100	.....	.....	
14,250	57,000	.002000	.000100	.....	.....	
14,500	58,000	.002300	.000300	.....	.....	
15,000	60,000	.002825	.000525	.....	.....	
15,500	62,010	.003425	.000690	.....	.....	
16,000	64,000	.004900	.001575	.....	.....	
16,500	66,000	.006750	.001750	.....	.....	
17,000	68,000	.008125	.001375	.....	.....	
27,480	109,920	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 109,920  
 Elastic limit per square inch of original section.....do... 55,000  
 Elongation per inch after rupture.....inch... .1400  
 Elongation per inch under strain at elastic limit.....do... .001800  
 Reduction in diameter at point of rupture.....do... .084  
 Reduction in area after rupture, per centum of original section..... 27.6  
 Position of rupture.....1".40 from neck  
 Character of broken surface.....granular; silky center  
 Elongation of inch sections.....".15, ".21, ".12, ".11

No. 4148.

Marks,  $^{12}M R_3 B_3$ Diameter,  $\frac{T_3}{T_1}$  .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	0.	0.	
5,000	20,000	.000575	.000275	0.	0.	
7,500	30,000	.000950	.000375	0.	0.	
10,000	40,000	.001275	.000325	0.	0.	
11,250	45,000	.001450	.000175	0.	0.	
12,500	50,000	.001650	.000200	0.	0.	
12,750	51,000	.001675	.000025	0.	0.	
13,000	52,000	.001700	.000025	0.	0.	
13,250	53,000	.001750	.000050	0.	0.	Elastic limit.
13,500	54,000	.001800	.000050	0.	0.	
13,750	55,000	.001900	.000100	0.	0.	
14,000	56,000	.002000	.000100	0.	0.	
14,250	57,000	.002125	.000125	0.	0.	
14,750	59,000	.002450	.000325	0.	0.	
15,250	61,000	.003125	.000675	0.	0.	
15,750	63,000	.004200	.001075	0.	0.	
16,250	65,000	.005750	.001550	0.	0.	
16,750	67,000	.007500	.001750	0.	0.	
27,290	109,160	-----	-----	-----	-----	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 109,160  
 Elastic limit per square inch of original section..... do... 54,000  
 Elongation per inch after rupture..... inch... .1325  
 Elongation per inch under strain at elastic limit ..... do... .001800  
 Reduction in diameter at point of rupture ..... do... .084  
 Reduction in area after rupture, per centum of original section..... 27.6  
 Position of rupture ..... 2". 15 from neck  
 Character of broken surface ..... granular; silky center  
 Elongation of inch sections ..... ".09, ".20, ".15, ".09

H. Ex. 165—26

## No. 4149.

Marks,  $12 \text{ MR}_3 \text{ B}_5$ Diameter,  $\frac{T_4 M}{T_4 M}$ , ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000275	.000150	0.	0.	
5,000	20,000	.000600	.000325	0.	0.	
7,500	30,000	.000950	.000350	0.	0.	
10,000	40,000	.001300	.000350	0.	0.	
11,250	45,000	.001475	.000175	0.	0.	
12,500	50,000	.001675	.000200	0.	0.	
12,750	51,000	.001700	.000025	0.	0.	
13,000	52,000	.001750	.000050	0.	0.	
13,250	53,000	.001775	.000025	0.	0.	Elastic limit.
13,500	54,000	.001900	.000125	0.	0.	
13,750	55,000	.002100	.000200	0.	0.	
14,000	56,000	.002275	.000175	0.	0.	
14,500	58,000	.002825	.000550	0.	0.	
15,000	60,000	.003875	.001050	0.	0.	
15,500	62,000	.005250	.001375	0.	0.	
16,000	64,000	.006750	.001500	0.	0.	
16,500	66,000	.008450	.001700	0.	0.	
26,970	107,880	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 107,880  
 Elastic limit per square inch of original section.....do... 53,000  
 Elongation per inch after rupture.....inch... .1500  
 Elongation per inch under strain at elastic limit.....do... .001775  
 Reduction in diameter at point of rupture.....do... .074  
 Reduction in area after rupture, per centum of original section.....24.6  
 Position of rupture.....2" .20 from neck  
 Character of broken surface.....granular, radiating from a dull spot at the circumference.  
 Elongation of inch sections.....".10, ".18, ".21\*, ".11



## 12-INCH B. L. MORTAR, NO. 9.

HOOP A<sub>4</sub>.

No. 4125.

Marks, <sup>12 M R<sub>3</sub> A<sub>4</sub></sup><sub>T, O</sub>Diameter, <sup>17</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	.....	.....	
2,500	10,000	.000400	.000250	.....	.....	
5,000	20,000	.000725	.000325	.....	.....	
7,500	30,000	.001050	.000325	.....	.....	
10,000	40,000	.001450	.000400	.....	.....	
11,250	45,000	.001600	.000150	.000025	.000025	
12,500	50,000	.001800	.000200	.000025	0.	
13,750	51,000	.001850	.000050	.....	.....	
13,000	52,000	.001900	.000050	.....	.....	Elastic limit.
13,250	53,000	.001950	.000050	.....	.....	
13,500	54,000	.002000	.000050	.....	.....	
13,750	55,000	.002100	.000100	.....	.....	
14,000	56,000	.002350	.000250	.....	.....	
14,250	57,000	.002600	.000250	.....	.....	
14,750	59,000	.004050	.001450	.....	.....	
15,250	61,000	.005875	.001825	.....	.....	
15,750	63,000	.007750	.001875	.....	.....	
16,250	65,000	.009375	.001625	.....	.....	
16,750	67,000	.011250	.001875	.....	.....	Tensile strength.
25,580	102,320	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 102,320  
 Elastic limit per square inch of original section ..... do... 54,000  
 Elongation per inch after rupture ..... inch... .1750  
 Elongation per inch under strain at elastic limit ..... do... .002000  
 Reduction in diameter at point of rupture ..... do... .114  
 Reduction in area after rupture, per centum of original section ..... 36.4  
 Position of rupture ..... 1".40 from neck  
 Character of broken surface ..... silky center; granular at circumference  
 Elongation of inch sections ..... ".11, ".14, ".29\*, ".16

HOOP A<sub>6</sub>.

No. 4144.

Marks, <sup>12 M R<sub>9</sub> A<sub>6</sub></sup><sub>T<sub>1</sub> O</sub>Diameter, <sup>1</sup>/<sub>1</sub>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	0.	-----	
2,500	10,000	.000300	.000150	-----	-----	
5,000	20,000	.000700	.000400	-----	-----	
7,500	30,000	.001025	.000325	-----	-----	
10,000	40,000	.001350	.000325	-----	-----	
11,250	45,000	.001475	.000125	0.	-----	
12,500	50,000	.001650	.000175	0.	-----	
12,750	51,000	.001700	.000050	-----	-----	Elastic limit.
13,000	52,000	.001725	.000025	-----	-----	
13,250	53,000	.001775	.000050	-----	-----	
13,500	54,000	.001825	.000050	-----	-----	
13,750	55,000	.001925	.000100	-----	-----	
14,000	56,000	.002075	.000150	-----	-----	
14,250	57,000	.002200	.000125	-----	-----	
14,750	59,000	.003000	.000800	-----	-----	
15,250	61,000	.004250	.001250	-----	-----	
15,750	63,000	.006500	.002250	-----	-----	Tensile strength.
16,250	65,000	.008450	.001950	-----	-----	
16,750	67,000	.010250	.001800	-----	-----	
25,580	102,320	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section..... pounds.. 102,320  
 Elastic limit per square inch of original section..... do... 54,000  
 Elongation per inch after rupture..... inch... .1675  
 Elongation per inch under strain at elastic limit..... do... .001825  
 Reduction in diameter at point of rupture..... do... .094  
 Reduction in area after rupture, per centum of original section..... 30.6  
 Position of rupture..... 1".75 from neck  
 Character of broken surface..... granular; dull eccentric spot  
 Elongation of inch sections..... "11, "15, "28, "13

HOOP B<sub>1</sub>.

No. 4142.

Marks, <sup>12</sup> M R<sub>0</sub> B<sub>1</sub>  
<sub>T<sub>1</sub> O</sub>Diameter, <sup>11</sup> .564.

Sectional area, .25 square inch.

Gauged length, 4''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000325	.000175	.....	.....	
5,000	20,000	.000700	.000375	.....	.....	
7,500	30,000	.001075	.000375	.....	.....	
10,000	40,000	.001450	.000375	.....	.....	
11,250	45,000	.001625	.000175	.000025	.000025	
12,500	50,000	.001800	.000175	.000025	0.	
12,750	51,000	.001825	.000025	.....	.....	
13,000	52,000	.001875	.000050	.....	.....	
13,250	53,000	.001925	.000050	.....	.....	
13,500	54,000	.002000	.000075	.....	.....	
13,750	55,000	.002025	.000025	.....	.....	
14,000	56,000	.002050	.000025	.....	.....	Elastic limit.
14,250	57,000	.002125	.000075	.....	.....	
14,500	58,000	.002250	.000125	.....	.....	
14,750	59,000	.002350	.000100	.....	.....	
15,000	60,000	.002700	.000350	.....	.....	
15,500	62,000	.004375	.001675	.....	.....	
16,000	64,000	.006500	.002125	.....	.....	
16,500	66,000	.008375	.001875	.....	.....	
17,000	68,000	.010050	.001675	.....	.....	
17,500	70,000	.012050	.002000	.....	.....	Tensile strength.
26,080	104,320	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 104,320  
 Elastic limit per square inch of original section.....do.. 57,000  
 Elongation per inch after rupture.....inch.. .1900  
 Elongation per inch under strain at elastic limit.....do... .002125  
 Reduction in diameter at point of rupture.....do... .134  
 Reduction in area after rupture, per centum of original section.....41.9  
 Position of rupture.....1.75 from neck  
 Character of broken surface.....silky, interspersed with granular metal at the circumference  
 Elongation of inch sections....."10,"16,"34,"16

## 12-INCH B. L. MORTAR, NO. 10.

HOOP A<sub>3</sub>.

No. 4128.

Marks, <sup>12 M R<sub>10</sub> A<sub>3</sub></sup>  
<sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000150	.000150	0.		
2,500	10,000	.000375	.000225			
5,000	20,000	.000675	.000300			
7,500	30,000	.001025	.000350			
10,000	40,000	.001375	.000350			
11,250	45,000	.001525	.000150	0.		
12,500	50,000	.001675	.000150	0.		
12,750	51,000	.001725	.000050			
13,000	52,000	.001750	.000025			
13,250	53,000	.001775	.000025			
13,500	54,000	.001825	.000050			
13,750	55,000	.001875	.000050			
14,000	56,000	.001950	.000075			
14,250	57,000	.002000	.000050			
14,500	58,000	.002050	.000050			
14,750	59,000	.002100	.000050			
15,000	60,000	.002200	.000100			
15,250	61,000	.002275	.000075			
15,500	62,000	.002425	.000150			Elastic limit.
15,750	63,000	.002550	.000125			
16,000	64,000	.002925	.000375			
16,500	66,000	.003925	.001000			
17,000	68,000	.005700	.001775			
17,500	70,000	.007500	.001800			
18,000	72,000	.009250	.001750			
18,500	74,000	.010825	.001575			
27,590	110,360					Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds ..	110,360
Elastic limit per square inch of original section .....	do ..	61,000
Elongation per inch after rupture .....	inch ..	.13
Elongation per inch under strain at elastic limit .....	do ..	.002275
Reduction in diameter at point of rupture .....	do ..	.064
Reduction in area after rupture, per centum of original section .....		21.4
Position of rupture .....		1".90 from neck
Character of broken surface .....	granular, radiating from a small dull spot in circumference	
Elongation of inch sections .....	" .09, " .20, " .13, " .10	

HOOP A<sub>6</sub>.

No. 4153.

Marks, <sup>12 M R<sub>19</sub> A<sub>6</sub></sup><sub>T<sub>2</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000700	.000400	.....	.....	
7,500	30,000	.001075	.000375	.....	.....	
10,000	40,000	.001425	.000350	.....	.....	
11,250	45,000	.001575	.000150	.000150	.000150	
12,500	50,000	.001775	.000200	.000175	.000025	
12,750	51,000	.001800	.000025	.....	.....	
13,000	52,000	.001825	.000025	.....	.....	
13,250	53,000	.001875	.000050	.....	.....	
13,500	54,000	.001925	.000050	.....	.....	
13,750	55,000	.001960	.000025	.....	.....	
14,000	56,000	.002000	.000050	.....	.....	
14,250	57,000	.002050	.000050	.....	.....	Elastic limit.
14,500	58,000	.002200	.000150	.....	.....	
14,750	59,000	.002325	.000125	.....	.....	
15,000	60,000	.002825	.000500	.....	.....	
15,500	62,000	.005175	.002350	.....	.....	
16,000	64,000	.007250	.002075	.....	.....	
16,500	66,000	.009000	.001750	.....	.....	
17,000	68,000	.011000	.002000	.....	.....	
17,500	70,000	.012875	.001875	.....	.....	
25,470	101,880	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 101,880  
 Elastic limit per square inch of original section.....do... 57,000  
 Elongation per inch after rupture.....inch... .1775  
 Elongation per inch under strain at elastic limit.....do... .002050  
 Reduction in diameter at point of rupture.....do... .134  
 Reduction in area after rupture, per centum of original section.....41.9  
 Position of rupture.....1".7 from neck  
 Character of broken surface.....silky, interspersed with granular metal at the circumference  
 Elongation of inch sections.....".13, ".34, ".14, ".10

HOOP B<sub>1</sub>.

No. 4146.

Marks, <sup>12MR<sub>10</sub>B<sub>1</sub></sup><sub>T<sub>1</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000175	.000175	.....	.....	
2,500	10,000	.000325	.000150	.....	.....	
5,000	20,000	.000700	.000375	.....	.....	
7,500	30,000	.001000	.000300	.....	.....	
10,000	40,000	.001500	.000500	.....	.....	
11,250	45,000	.001700	.000200	.000025	.000025	
12,500	50,000	.001800	.000100	.000025	0.	
12,750	51,000	.001825	.000025	.....	.....	
13,000	52,000	.001875	.000050	.....	.....	
13,250	53,000	.001925	.000050	.....	.....	Elastic limit.
13,500	54,000	.001950	.000025	.....	.....	
13,750	55,000	.002000	.000050	.....	.....	
14,000	56,000	.002050	.000050	.....	.....	
14,250	57,000	.002100	.000050	.....	.....	
14,500	58,000	.002200	.000100	.....	.....	
14,750	59,000	.002300	.000100	.....	.....	
15,000	60,000	.002525	.000225	.....	.....	
15,500	62,000	.003500	.000975	.....	.....	
16,000	64,000	.005750	.002250	.....	.....	
16,500	66,000	.008050	.002300	.....	.....	Tensile strength.
17,000	68,000	.010250	.002200	.....	.....	
17,500	70,000	.012250	.002000	.....	.....	
25,170	100,680	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section..... pounds.. 100,680  
 Elastic limit per square inch of original section..... do... 57,000  
 Elongation per inch after rupture..... inch... .1675  
 Elongation per inch under strain at elastic limit..... do... .002100  
 Reduction in diameter at point of rupture..... do... .114  
 Reduction in area after rupture, per centum of original section..... 36.4  
 Position of rupture..... 1".60 from neck  
 Character of broken surface..... granular, 60 per cent.; silky, 40 per cent.  
 Elongation of inch sections..... ".12, ".30", ".13, ".12

## 12-INCH B. L. MORTAR, NO. 11.

HOOP A<sub>4</sub>.

No. 4143.

Marks, <sup>12 M R<sub>11</sub> A<sub>4</sub></sup><sub>T<sub>10</sub></sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	.....	.....	
5,000	20,000	.000650	.000350	.....	.....	
7,500	30,000	.001000	.000350	.....	.....	
10,000	40,000	.001325	.000325	.....	.....	
11,250	45,000	.001500	.000175	.0	.....	
12,500	50,000	.001700	.000200	.0	.....	
12,750	51,000	.001725	.000025	.....	.....	
13,000	52,000	.001750	.000025	.....	.....	
13,250	53,000	.001800	.000050	.....	.....	
13,500	54,000	.001825	.000025	.....	.....	
13,750	55,000	.001875	.000050	.....	.....	
14,000	56,000	.001925	.000050	.....	.....	
14,250	57,000	.001975	.000050	.....	.....	Elastic limit.
14,500	58,000	.002050	.000075	.....	.....	
14,750	59,000	.002200	.000150	.....	.....	
15,000	60,000	.002450	.000250	.....	.....	
15,250	61,000	.002800	.000350	.....	.....	
15,750	63,000	.004500	.001700	.....	.....	
16,250	65,000	.006875	.002375	.....	.....	
16,750	67,000	.008750	.001875	.....	.....	
17,250	69,000	.010700	.001950	.....	.....	
17,750	71,000	.012750	.002050	.....	.....	
25,630	102,520	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 102,520  
 Elastic limit per square inch of original section ..... do... 58,000  
 Elongation per inch after rupture ..... inch... .1625  
 Elongation per inch under strain at elastic limit ..... do... .002050  
 Reduction in diameter at point of rupture ..... do... .104  
 Reduction in area after rupture, per centum of original section ..... 33.5  
 Position of rupture ..... 1" .45 from neck  
 Character of broken surface ..... granular, silky center  
 Elongation of inch sections ..... ".09, ".13, ".28, ".15

HOOP B<sub>5</sub>.

No. 4150.

Marks, <sup>12 M R<sub>11</sub> B<sub>5</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, 11.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000275	.000175	.....	.....	
5,000	20,000	.000575	.000300	.....	.....	
7,500	30,000	.000950	.000375	.....	.....	
10,000	40,000	.001275	.000325	.....	.....	
11,250	45,000	.001425	.000150	0.	.....	
12,500	50,000	.001600	.000175	0.	.....	
12,750	51,000	.001650	.000050	.....	.....	
13,000	52,000	.001675	.000025	.....	.....	Elastic limit.
13,250	53,000	.001725	.000050	.....	.....	
13,500	54,000	.001750	.000025	.....	.....	
13,750	55,000	.001775	.000025	.....	.....	
14,000	56,000	.001850	.000075	.....	.....	
14,250	57,000	.002025	.000175	.....	.....	
14,500	58,000	.002250	.000225	.....	.....	
15,000	60,000	.002950	.000700	.....	.....	
15,500	62,000	.004625	.001675	.....	.....	
16,000	64,000	.006500	.001875	.....	.....	Tensile strength.
16,500	66,000	.008625	.002125	.....	.....	
17,000	68,000	.010375	.001750	.....	.....	
25,820	103,280	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 103,280  
 Elastic limit per square inch of original section ..... do... 55,000  
 Elongation per inch after rupture ..... inch.. .1800  
 Elongation per inch under strain at elastic limit ..... do... .001775  
 Reduction in diameter at point of rupture ..... do... .134  
 Reduction in area after rupture, per centum of original section ..... 41.9  
 Position of rupture ..... 1.70 from neck  
 Character of broken surface ..... silky, interspersed with granular metal at the circumference  
 Elongation of inch sections ..... " 12, " 15, " 33, " 12



## 12-INCH B. L. MORTAR, NO. 12.

HOOP, A<sub>4</sub>.

No. 4151.

Marks, <sup>12 M R<sub>12</sub> A<sub>4</sub></sup><sub>T<sub>1</sub> O</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	0.	
2,500	10,000	.000300	.000150	.....	.....	
5,000	20,000	.000625	.000325	.....	.....	
7,500	30,000	.001025	.000400	.....	.....	
10,000	40,000	.001300	.000275	.....	.....	
11,250	45,000	.001475	.000175	0.	.....	
12,500	50,000	.001650	.000175	0.	.....	
12,750	51,000	.001700	.000050	.....	.....	
13,000	52,000	.001750	.000050	.....	.....	Elastic limit.
13,250	53,000	.001775	.000025	.....	.....	
13,500	54,000	.001825	.000050	.....	.....	
13,750	55,000	.001875	.000050	.....	.....	
14,000	56,000	.002050	.000175	.....	.....	
14,250	57,000	.002375	.000325	.....	.....	
14,500	58,000	.002925	.000550	.....	.....	
15,000	60,000	.004750	.001825	.....	.....	
15,500	62,000	.006700	.001950	.....	.....	
16,000	64,000	.008375	.001675	.....	.....	Tensile strength.
16,500	66,000	.010000	.001625	.....	.....	
17,000	68,000	.011875	.001875	.....	.....	
25,620	102,480	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 102,480  
 Elastic limit per square inch of original section ..... do... 55,000  
 Elongation per inch after rupture ..... inch... .1700  
 Elongation per inch under strain at elastic limit ..... do... .001875  
 Reduction in diameter at point of rupture ..... do... .124  
 Reduction in area after rupture, per centum of original section ..... 39.2  
 Position of rupture ..... "1.45 from neck  
 Character of broken surface ..... silky, interspersed with granular metal at the circumference  
 Elongation of inch sections ..... ".10, ".12, ".29\*, ".17

HOOP B<sub>1</sub>.

No. 4154.

Marks,  $12 M R_{12} B_1$   
T<sub>1</sub> O

Diameter, ".564.

Sectional area, .25 square inch

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175			
5,000	20,000	.000600	.000300			
7,500	30,000	.000950	.000350			
10,000	40,000	.001275	.000325			
11,250	45,000	.001450	.000175	0.		
12,500	50,000	.001600	.000150	0.		
12,750	51,000	.001650	.000050			
13,000	52,000	.001675	.000025			
13,250	53,000	.001725	.000050			
13,500	54,000	.001750	.000025			
13,750	55,000	.001775	.000025			
14,000	56,000	.001800	.000025			
14,250	57,000	.001825	.000025			
14,500	58,000	.001875	.000050			
14,750	59,000	.001925	.000050			
15,000	60,000	.001975	.000050			
15,250	61,000	.002000	.000025			Elastic limit.
15,500	62,000	.002075	.000075			
15,750	63,000	.002150	.000075			
16,000	64,000	.002300	.000150			
16,500	66,000	.002700	.000400			
17,000	68,000	.004500	.001800			
17,500	70,000	.006550	.002050			
18,000	72,000	.008250	.001700			
18,500	74,000	.009875	.001625			
27,910	111,640					Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 111,640  
 Elastic limit per square inch of original section ..... do... 61,000  
 Elongation per inch after rupture ..... inch... .1475  
 Elongation per inch under strain at elastic limit ..... do... .002000  
 Reduction in diameter at point of rupture ..... do... .104  
 Reduction in area after rupture, per centum of original section ..... 33.5  
 Position of rupture ..... "1.05 from neck  
 Character of broken surface ..... granular, silky center  
 Elongation of inch sections ..... ".22\*, ".17, ".11, ".09

## 12-INCH B. L. MORTAR, NO. 13.

HOOP A<sub>3</sub>.

No. 4156.

Marks, <sup>12</sup>M R<sub>12</sub> A<sub>3</sub>Diameter, <sup>T<sub>2</sub>1</sup>564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000300	.000175	.....	.....	
5,000	20,000	.000650	.000350	.....	.....	
7,500	30,000	.001025	.000375	.....	.....	
10,000	40,000	.001400	.000375	.....	.....	
11,250	45,000	.001550	.000150	0.	.....	
12,500	50,000	.001760	.000200	0.	.....	
12,750	51,000	.001775	.000025	.....	.....	
13,000	52,000	.001800	.000025	.....	.....	
13,250	53,000	.001850	.000050	.....	.....	
13,500	54,000	.001900	.000050	.....	.....	
13,750	55,000	.001950	.000050	.....	.....	
14,000	56,000	.001975	.000025	.....	.....	Elastic limit.
14,250	57,000	.002000	.000025	.....	.....	
14,500	58,000	.002050	.000050	.....	.....	
14,750	59,000	.002100	.000050	.....	.....	
15,000	60,000	.002200	.000100	.....	.....	
15,250	61,000	.002300	.000100	.....	.....	
15,500	62,000	.002550	.000250	.....	.....	
16,000	64,000	.004375	.001825	.....	.....	
16,500	66,000	.006950	.002575	.....	.....	
17,000	68,000	.009125	.002175	.....	.....	
17,500	70,000	.011125	.002000	.....	.....	
18,000	72,000	.013125	.002000	.....	.....	
25,410	101,640	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 101,640  
 Elastic limit per square inch of original section ..... do... 59,000  
 Elongation per inch after rupture ..... inch... .1775  
 Elongation per inch under strain at elastic limit..... do... .002100  
 Reduction in diameter at point of rupture ..... do... .154  
 Reduction in area after rupture, per centum of original section ..... 47.2  
 Position of rupture ..... at middle of stem  
 Character of broken surface..... silky; trace of granulation  
 Elongation of inch sections ..... "10, ".29\*, ".25\*, ".07

HOOP B<sub>1</sub>.

No. 4166.

Marks, <sup>12 M R<sub>13</sub> B<sub>1</sub></sup><sub>T<sub>3</sub> M</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000350	.000225	.....	.....	
5,000	20,000	.000700	.000350	.....	.....	
7,500	30,000	.001100	.000400	.....	.....	
10,000	40,000	.001425	.000325	.....	.....	
11,250	45,000	.001600	.000175	.000100	.000100	
12,500	50,000	.001825	.000225	.000100	0.	
12,750	51,000	.001850	.000025	.....	.....	
13,000	52,000	.001875	.000025	.....	.....	Elastic limit.
13,250	53,000	.001925	.000050	.....	.....	
13,500	54,000	.002100	.000175	.....	.....	
13,750	55,000	.002325	.000225	.....	.....	
14,000	56,000	.003000	.000675	.....	.....	
14,500	58,000	.004875	.001875	.....	.....	
15,000	60,000	.006775	.001900	.....	.....	
15,500	62,000	.008500	.001725	.....	.....	
16,000	64,000	.010425	.001925	.....	.....	
16,500	66,000	.012000	.001575	.....	.....	Tensile strength.
25,030	100,120	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 100,120  
 Elastic limit per square inch of original section.....do... 53,000  
 Elongation per inch after rupture.....inch... .1750  
 Elongation per inch under strain at elastic limit.....do... .001925  
 Reduction in diameter at point of rupture.....do... .134  
 Reduction in area after rupture, per centum of original section.....41.9  
 Position of rupture.....1".3 from neck  
 Character of broken surface.....silky, interspersed with granular metal at the circumference  
 Elongation of inch sections.....".18, ".28, ".13, ".11

## 12-INCH B. L. MORTAR, NO. 14.

HOOP A<sub>4</sub>.

No. 4155.

Marks, <sup>12 M R<sub>14</sub> A<sub>4</sub></sup><sub>T, O</sub>

Diameter, "564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000250	.000150			
5,000	20,000	.000550	.000300			
7,500	30,000	.000925	.000375			
10,000	40,000	.001225	.000300			
11,250	45,000	.001400	.000175	0.		
12,500	50,000	.001550	.000150	0.		
12,750	51,000	.001600	.000050			
13,000	52,000	.001625	.000025			
13,250	53,000	.001675	.000050			Elastic limit.
13,500	54,000	.001775	.000100			
13,750	55,000	.002250	.000475			
14,000	56,000	.004200	.002050			
14,500	58,000	.006750	.002550			
15,000	60,000	.009500	.002750			
15,500	62,000	.010625	.001125			
16,000	64,000	.012500	.001875			
16,500	66,000	.015125	.002625			
23,820	95,280					Tensile strength.

## General summary.

Tensile strength per square inch of original section.....	pounds..	95,280
Elastic limit per square inch of original section.....	do...	53,000
Elongation per inch after rupture.....	inch...	.2075
Elongation per inch under strain at elastic limit.....	do...	.001675
Reduction in diameter at point of rupture.....	do...	.174
Reduction in area after rupture, per centum of original section.....		52.2
Position of rupture.....	2".05 from neck	
Character of broken surface.....	silky	
Elongation of inch sections.....	"12, ".41*, ".18, ".12	

HOOP B<sub>5</sub>.

No. 4261.

Marks, <sup>12 M R<sub>14</sub> B<sub>5</sub></sup><sub>T<sub>3</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000225	.000125	-----	-----	
5,000	20,000	.000350	.000325	-----	-----	
7,500	30,000	.000900	.000350	-----	-----	
10,000	40,000	.001250	.000350	-----	-----	
11,250	45,000	.001425	.000175	0.	0.	
12,500	50,000	.001600	.000175	.000025	.000025	
12,750	51,000	.001650	.000050	-----	-----	
13,000	52,000	.001700	.000050	-----	-----	
13,250	53,000	.001725	.000025	-----	-----	Elastic limit.
13,500	54,000	.001750	.000025	-----	-----	
13,750	55,000	.001825	.000075	-----	-----	
14,000	56,000	.002075	.000250	-----	-----	
14,250	57,000	.002525	.000450	-----	-----	
14,500	58,000	.003675	.001150	-----	-----	
15,000	60,000	.005725	.002050	-----	-----	
15,500	62,000	.007250	.001525	-----	-----	
16,000	64,000	.008750	.001500	-----	-----	
16,500	66,000	.010700	.001950	-----	-----	
17,000	68,000	.012400	.001700	-----	-----	Tensile strength.
25,390	101,560	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 101,560  
 Elastic limit per square inch of original section ..... do... 55,000  
 Elongation per inch after rupture ..... inch... .1750  
 Elongation per inch under strain at elastic limit ..... do... .001825  
 Reduction in diameter at point of rupture ..... do... .134  
 Reduction in area after rupture, per centum of original section ..... 41.9  
 Position of rupture ..... at middle of stem  
 Character of broken surface ..... silky, interspersed with granular metal at the circumference  
 Elongation of inch sections ..... ".10, ".22\*, ".26\*, ".12

## 12-INCH B. L. MORTAR, NO. 15.

HOOP A<sub>3</sub>

No. 4268.

Marks, <sup>12 M R<sub>15</sub> A<sub>3</sub></sup><sub>T, O</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,200	5,000	.000125	.000125	0.		
2,500	10,000	.000300	.000175			
5,000	20,000	.000650	.000350			
7,500	30,000	.000950	.000300			
10,000	40,000	.001275	.000325			
11,250	45,000	.001450	.000175	0.		
12,500	50,000	.001625	.000175	0.		
12,750	51,000	.001650	.000025			
13,000	52,000	.001700	.000050			
13,250	53,000	.001750	.000050			
13,500	54,000	.001775	.000025			
13,750	55,000	.001825	.000050			
14,000	56,000	.001875	.000050			
14,250	57,000	.001900	.000025			
14,500	58,000	.001950	.000050			
14,750	59,000	.001975	.000025			
15,000	60,000	.002025	.000050			
15,250	61,000	.002050	.000025			Elastic limit.
15,500	62,000	.002075	.000025			
15,750	63,000	.002125	.000050			
16,000	64,000	.002250	.000125			
16,250	65,000	.002325	.000075			
16,500	66,000	.002450	.000125			
17,000	68,000	.003050	.000600			
17,500	70,000	.004775	.001725			
18,000	72,000	.006700	.001925			
18,500	74,000	.008450	.001750			
28,120	112,480					Tensile strength.

## General summary.

Tensile strength per square inch of original section.....	pounds..	112,480
Elastic limit per square inch of original section.....	do..	63,000
Elongation per inch after rupture.....	inch..	.1475
Elongation per inch under strain at elastic limit.....	do..	.002125
Reduction in diameter at point of rupture.....	do..	.104
Reduction in area after rupture, per centum of original section.....		33.5
Position of rupture.....	1".25 from neck	
Character of broken surface.....	granular, silky center	
Elongation of inch sections.....	"16, "22, "12, ".09	

H. Ex. 165—27

HOOP B<sub>1</sub>.

No. 4262.

Marks, <sup>12</sup>M R<sub>15</sub> B<sub>1</sub>  
<sub>T<sub>1</sub>O</sub>Diameter, <sup>11</sup>564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>In ch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	.....	
2,500	10,000	.000350	.000225	.....	.....	
5,000	20,000	.000650	.000300	.....	.....	
7,500	30,000	.000950	.000300	.....	.....	
10,000	40,000	.001275	.000325	.....	.....	
11,250	45,000	.001450	.000175	0.	.....	
12,500	50,000	.001625	.000175	0.	.....	
12,750	51,000	.001650	.000025	.....	.....	
13,000	52,000	.001675	.000025	.....	.....	
13,250	53,000	.001700	.000025	.....	.....	
13,500	54,000	.001750	.000050	.....	.....	
13,750	55,000	.001775	.000025	.....	.....	
14,000	56,000	.001825	.000050	.....	.....	
14,250	57,000	.001850	.000025	.....	.....	
14,500	58,000	.001900	.000050	.....	.....	
14,750	59,000	.001950	.000050	.....	.....	
15,000	60,000	.002000	.000050	.....	.....	
15,250	61,000	.002050	.000050	.....	.....	Elastic limit.
15,500	62,000	.002275	.000225	.....	.....	
15,750	63,000	.002575	.000300	.....	.....	
16,000	64,000	.003625	.001050	.....	.....	
16,500	66,000	.005750	.002125	.....	.....	
17,000	68,000	.007575	.001825	.....	.....	Tensile strength.
17,500	70,000	.009125	.001550	.....	.....	
18,000	72,000	.011000	.001875	.....	.....	
18,500	74,000	.013000	.002000	.....	.....	
20,250	105,160	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 105,160  
 Elastic limit per square inch of original section.....do... 61,000  
 Elongation per inch after rupture.....inch... .1750  
 Elongation per inch under strain at elastic limit.....do... .002050  
 Reduction in diameter at point of rupture.....do... .154  
 Reduction in area after rupture, per centum of original section.....47.2  
 Position of rupture.....1" 30 from neck  
 Character of broken surface.....silty  
 Elongation of inch sections.....".25, ".23, ".12, ".10



## 12-INCH B. L. MORTAR, NO. 16.

HOOP A<sub>4</sub>.

No. 4265.

Marks, <sup>12 M R<sub>16</sub> A<sub>4</sub></sup><sub>T<sub>1</sub> O</sub>Diameter, <sup>11</sup>.564.

Sectional area, .25 square inch.

Gauged length, 4''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.	0.	
2,500	10,000	.000250	.000175	0.	0.	
5,000	20,000	.000525	.000275	0.	0.	
7,500	30,000	.000925	.000400	0.	0.	
10,000	40,000	.001225	.000300	0.	0.	
11,250	45,000	.001425	.000200	0.	0.	
12,500	50,000	.001600	.000175	0.	0.	
12,750	51,000	.001650	.000050	0.	0.	
13,000	52,000	.001700	.000050	0.	0.	
13,250	53,000	.001725	.000025	0.	0.	
13,500	54,000	.001750	.000025	0.	0.	
13,750	55,000	.001800	.000050	0.	0.	
14,000	56,000	.001825	.000025	0.	0.	
14,250	57,000	.001875	.000050	0.	0.	
14,500	58,000	.001925	.000050	0.	0.	Elastic limit.
14,750	59,000	.001975	.000050	0.	0.	
15,000	60,000	.002075	.000100	0.	0.	
15,250	61,000	.002200	.000125	0.	0.	
15,500	62,000	.002425	.000225	0.	0.	
16,000	64,000	.002950	.000525	0.	0.	
16,500	66,000	.004000	.001050	0.	0.	
17,000	68,000	.005500	.001500	0.	0.	
17,500	70,000	.007125	.001625	0.	0.	
18,000	72,000	.008750	.001625	0.	0.	
28,120	112,480	-----	-----	-----	-----	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	112,480
Elastic limit per square inch of original section .....	do..	59,000
Elongation per inch after rupture .....	inch..	.1600
Elongation per inch under strain at elastic limit .....	do..	.001975
Reduction in diameter at point of rupture .....	do..	.084
Reduction in area after rupture, per centum of original section .....		27.6
Position of rupture .....	1" .40 from neck	
Character of broken surface .....	granular, silky center	
Elongation of inch sections .....	" .17, " .22*, " .15*, " .10	

HOOP B<sub>1</sub>.

No. 4266.

Marks, <sup>12 M R<sub>16</sub> B<sub>1</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000325	.000225	.....	.....	
5,000	20,000	.000700	.000375	.....	.....	
7,500	30,000	.001025	.000325	.....	.....	
10,000	40,000	.001350	.000325	.....	.....	
11,250	45,000	.001550	.000200	.000025	.000025	
12,500	50,000	.001725	.000175	.000025	0.	
12,750	51,000	.001750	.000025	.....	.....	
13,000	52,000	.001775	.000025	.....	.....	Elastic limit.
13,250	53,000	.001825	.000050	.....	.....	
13,500	54,000	.001875	.000050	.....	.....	
13,750	55,000	.001975	.000100	.....	.....	
14,000	56,000	.002100	.000125	.....	.....	
14,250	57,000	.002250	.000150	.....	.....	
14,750	59,000	.002575	.000325	.....	.....	
15,250	61,000	.003750	.001175	.....	.....	
15,750	63,000	.005300	.001550	.....	.....	
16,250	65,000	.006875	.001575	.....	.....	Tensile strength.
16,750	67,000	.008375	.001500	.....	.....	
26,170	104,680	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	104,680
Elastic limit per square inch of original section.....	do...	54,000
Elongation per inch after rupture.....	inch..	.1725
Elongation per inch under strain at elastic limit.....	do...	.001875
Reduction in diameter at point of rupture.....	do...	.124
Reduction in area after rupture, per centum of original section.....		39.2
Position of rupture.....	2", 25 from neck	
Character of broken surface.....	granular at circumference; silky center	
Elongation of inch sections.....	"10, "21*, "29*, "09	

## 12-INCH B. L. MORTAR, NO. 17.

HOOP A<sub>4</sub>.

No. 4269.

Marks, 12 M R<sub>17</sub> A<sub>4</sub>Diameter,  $\frac{11}{16}$  5.64.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000075	.000075	0.	.....	
2,500	10,000	.000300	.000225	.....	.....	
5,000	20,000	.000625	.000325	.....	.....	
7,500	30,000	.001000	.000375	.....	.....	
10,000	40,000	.001300	.000360	.....	.....	
11,250	45,000	.001450	.000150	.000025	.000025	
12,500	50,000	.001625	.000175	.000025	0.	
12,750	51,000	.001700	.000075	.....	.....	
13,000	52,000	.001725	.000025	.....	.....	
13,250	53,000	.001775	.000050	.....	.....	Elastic limit.
13,500	54,000	.001800	.000025	.....	.....	
13,750	55,000	.001825	.000025	.....	.....	
14,000	56,000	.001850	.000025	.....	.....	
14,250	57,000	.001875	.000025	.....	.....	
14,500	58,000	.001975	.000100	.....	.....	
14,750	59,000	.002000	.000025	.....	.....	
15,000	60,000	.002025	.000025	.....	.....	
15,250	61,000	.002050	.000025	.....	.....	
15,500	62,000	.002150	.000100	.....	.....	
15,750	63,000	.002275	.000125	.....	.....	Tensile strength.
16,000	64,000	.002525	.000250	.....	.....	
16,500	66,000	.003725	.001200	.....	.....	
17,000	68,000	.005325	.001600	.....	.....	
17,500	70,000	.007150	.001825	.....	.....	
18,000	72,000	.008775	.001625	.....	.....	
18,500	74,000	.010275	.001500	.....	.....	
27,490	109,960	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 109,960  
 Elastic limit per square inch of original section ..... do... 61,000  
 Elongation per inch after rupture ..... inch... .155  
 Elongation per inch under strain at elastic limit ..... do... .002050  
 Reduction in diameter at point of rupture ..... do... .124  
 Reduction in area after rupture, per centum of original section ..... 39.2  
 Position of rupture ..... 2" from neck  
 Character of broken surface ..... silky  
 Elongation of inch sections ..... ".08, ".13, ".30\*, ".11

HOOP B<sub>1</sub>.

No. 4264.

Marks, <sup>12 M R<sub>17</sub> B<sub>1</sub></sup><sub>T<sub>1</sub> O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation. per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000075	.000075	0.	0.	
2, 500	10, 000	.000300	.000225	.....	.....	
5, 000	20, 000	.000550	.000250	.....	.....	
7, 500	30, 000	.000875	.000325	.....	.....	
10, 000	40, 000	.001250	.000375	.....	.....	
11, 250	45, 000	.001400	.000150	0.	.....	
12, 500	50, 000	.001575	.000175	0.	.....	
12, 750	51, 000	.001600	.000025	.....	.....	
13, 000	52, 000	.001625	.000025	.....	.....	
13, 250	53, 000	.001650	.000025	.....	.....	
13, 500	54, 000	.001700	.000050	.....	.....	
13, 750	55, 000	.001750	.000050	.....	.....	
14, 000	56, 000	.001775	.000025	.....	.....	
14, 250	57, 000	.001800	.000025	.....	.....	Elastic limit.
14, 500	58, 000	.001850	.000050	.....	.....	
14, 750	59, 000	.001875	.000025	.....	.....	
15, 000	60, 000	.001925	.000050	.....	.....	
15, 250	61, 000	.002000	.000075	.....	.....	
15, 500	62, 000	.002125	.000125	.....	.....	
15, 750	63, 000	.002325	.000200	.....	.....	
16, 000	64, 000	.002750	.000425	.....	.....	
16, 500	66, 000	.004000	.001250	.....	.....	
17, 000	68, 000	.005500	.001500	.....	.....	
17, 500	70, 000	.007300	.001800	.....	.....	Tensile strength.
18, 000	72, 000	.008825	.001515	.....	.....	
18, 500	74, 000	.010475	.001650	.....	.....	
27, 360	109, 440	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 109,440  
 Elastic limit per square inch of original section.....do.. 61,000  
 Elongation per inch after rupture.....inch.. .1550  
 Elongation per inch under strain at elastic limit.....do.. .002000  
 Reduction in diameter at point of rupture.....do.. .104  
 Reduction in area after rupture, per centum of original section..... 33.5  
 Position of rupture.....1".35 from neck  
 Character of broken surface.....granular; silky, eccentric spot  
 Elongation of inch sections.....".09, ".12, ".24, ".17

## 12-INCH B. L. MORTAR, NO. 18.

HOOP B<sub>1</sub>.

No. 4267.

Marks, <sup>12</sup>M R<sub>18</sub> B<sub>1</sub>  
T<sub>1</sub> ODiameter, <sup>1</sup>/<sub>2</sub> .564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	0.	
2,500	10,000	.000305	.000250	0.	0.	
5,000	20,000	.000700	.000325	0.	0.	
7,500	30,000	.001225	.000325	0.	0.	
10,000	40,000	.001425	.000400	0.	0.	
11,250	45,000	.001600	.000175	0.	0.	
12,500	50,000	.001750	.000150	0.	0.	
12,750	51,000	.001775	.000025	0.	0.	
13,000	52,000	.001800	.000025	0.	0.	
13,250	53,000	.001825	.000025	0.	0.	
13,500	54,000	.001875	.000050	0.	0.	
13,750	55,000	.001925	.000050	0.	0.	
14,000	56,000	.001975	.000050	0.	0.	
14,250	57,000	.002000	.000025	0.	0.	Elastic limit.
14,500	58,000	.002050	.000050	0.	0.	
14,750	59,000	.002100	.000050	0.	0.	
15,000	60,000	.002150	.000050	0.	0.	
15,250	61,000	.002200	.000050	0.	0.	
15,500	62,000	.002250	.000050	0.	0.	
15,750	63,000	.002400	.000150	0.	0.	
16,000	64,000	.002500	.000100	0.	0.	
16,250	65,000	.002700	.000200	0.	0.	
16,750	67,000	.003500	.000800	0.	0.	
17,250	69,000	.005500	.002000	0.	0.	Tensile strength.
17,750	71,000	.007450	.001950	0.	0.	
18,250	73,000	.008825	.001375	0.	0.	
18,750	75,000	.010700	.001875	0.	0.	
27,780	111,120					

## General summary.

Tensile strength per square inch of original section.....	pounds..	111,120
Elastic limit per square inch of original section.....	do...	62,000
Elongation per inch after rupture.....	inch..	.1525
Elongation per inch under strain at elastic limit.....	do...	.002250
Reduction in diameter at point of rupture.....	do...	.104
Reduction in area after rupture, per centum of original section.....		33.5
Position of rupture.....	1" from neck	
Character of broken surface.....	granular; silky center	
Elongation of inch sections.....	" .24*, ".16, ".11, ".10	

Specific gravity and hardness of cast-iron bodies and steel hoops.  
(No tension tests of these specimens.)

## CAST-IRON BODIES.

No. of mortar.	Marks on specimen.	Specific gravity.	Hardness.	Remarks.
1	12 M C <sub>1</sub> T R <sub>2</sub> B T <sub>1</sub> I .....	7.2499	15.43	
1	12 M C <sub>1</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2525	15.20	
1	12 M C <sub>1</sub> T R <sub>2</sub> B T <sub>3</sub> M .....	7.2487	14.76	
1	12 M C <sub>1</sub> T R <sub>3</sub> B T <sub>1</sub> I .....	7.2508	15.83	
1	12 M C <sub>1</sub> T R <sub>3</sub> B L <sub>6</sub> I .....	7.2539	14.98	
1	12 M C <sub>1</sub> T R <sub>3</sub> B L <sub>7</sub> O .....	7.2384	15.75	
1	12 M C <sub>1</sub> T R <sub>3</sub> B L <sub>8</sub> M .....	7.2570	16.90	
1	12 M R <sub>1</sub> T R <sub>1</sub> M T <sub>1</sub> I .....	7.2424	15.83	
1	12 M R <sub>1</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2352	15.20	
1	12 M R <sub>1</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2268	13.72	
1	12 M R <sub>1</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2478	15.59	
1	12 M R <sub>1</sub> T R <sub>2</sub> B T <sub>3</sub> O .....	7.2456	15.51	
1	12 M R <sub>1</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2473	15.13	
2	12 M R <sub>2</sub> T R <sub>2</sub> B L <sub>8</sub> .....	7.2359	16.23	
3	12 M R <sub>3</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2586	16.99	
3	12 M R <sub>3</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2566	17.99	
3	12 M R <sub>3</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2629	16.90	
3	12 M R <sub>3</sub> T R <sub>2</sub> B T <sub>1</sub> I .....	7.2564	16.56	
3	12 M R <sub>3</sub> T R <sub>2</sub> B T <sub>5</sub> M .....	7.2701	17.08	
3	12 M R <sub>3</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2677	16.31	
3	12 M R <sub>3</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2686	16.07	
3	12 M R <sub>3</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2733	16.90	
4	12 M R <sub>4</sub> T R <sub>1</sub> M T <sub>1</sub> I .....	7.2431	20.14	
4	12 M R <sub>4</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2462	19.39	
4	12 M R <sub>4</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2424	18.78	
4	12 M R <sub>4</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2505	18.78	
4	12 M R <sub>4</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2406	15.91	
4	12 M R <sub>4</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2511	16.64	
4	12 M R <sub>4</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2491	15.75	
4	12 M R <sub>4</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2492	15.59	
5	12 M R <sub>5</sub> T R <sub>1</sub> M T <sub>1</sub> I .....	7.2581	18.09	
5	12 M R <sub>5</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2677	19.29	
5	12 M R <sub>5</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2627	18.48	
5	12 M R <sub>5</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2690	18.28	
5	12 M R <sub>5</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2663	17.17	
5	12 M R <sub>5</sub> T R <sub>2</sub> B T <sub>5</sub> M .....	7.2675	16.56	
5	12 M R <sub>5</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2681	16.99	
5	12 M R <sub>5</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2677	16.47	
5	12 M R <sub>5</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2692	17.17	
5	12 M R <sub>5</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2660	15.59	
6	12 M R <sub>6</sub> T R <sub>1</sub> M T <sub>1</sub> I .....	7.2603	17.99	
6	12 M R <sub>6</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2703	19.71	
6	12 M R <sub>6</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2616	18.38	
6	12 M R <sub>6</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2780	18.68	
6	12 M R <sub>6</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2697	17.26	
6	12 M R <sub>6</sub> T R <sub>2</sub> B T <sub>4</sub> O .....	7.2713	16.07	
6	12 M R <sub>6</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2763	16.73	
6	12 M R <sub>6</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2761	16.31	
6	12 M R <sub>6</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2730	16.73	
7	12 M R <sub>7</sub> T R <sub>1</sub> M T <sub>1</sub> I .....	7.2602	17.99	
7	12 M R <sub>7</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2774	20.03	
7	12 M R <sub>7</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2781	18.19	
7	12 M R <sub>7</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2814	19.18	
7	12 M R <sub>7</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2350	14.47	
7	12 M R <sub>7</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2823	17.44	
7	12 M R <sub>7</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2776	15.59	
7	12 M R <sub>7</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2801	16.65	
8	12 M R <sub>8</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2805	17.44	
8	12 M R <sub>8</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2630	17.26	
8	12 M R <sub>8</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2803	17.81	
8	12 M R <sub>8</sub> T R <sub>2</sub> B T <sub>2</sub> I .....	7.2790	16.48	
8	12 M R <sub>8</sub> T R <sub>2</sub> B T <sub>4</sub> O .....	7.2802	16.64	
8	12 M R <sub>8</sub> T R <sub>2</sub> B T <sub>5</sub> O .....	7.2700	15.83	
8	12 M R <sub>8</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2861	16.23	
8	12 M R <sub>8</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2905	16.82	
8	12 M R <sub>8</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2908	16.99	
9	12 M R <sub>9</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2973	20.47	

## CAST-IRON BODIES—Continued.

No. of mortar.	Marks on specimen.	Specific gravity.	Hardness.	Remarks.
9	12 M R <sub>9</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2831	18.68	
9	12 M R <sub>9</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.3000	20.59	
9	12 M R <sub>9</sub> T R <sub>2</sub> B T <sub>3</sub> I .....	7.2909	16.73	
9	12 M R <sub>9</sub> T R <sub>2</sub> B T <sub>4</sub> O .....	7.2829	16.07	
9	12 M R <sub>9</sub> T R <sub>2</sub> B T <sub>5</sub> M .....	7.2886	15.28	
9	12 M R <sub>9</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2902	16.56	
9	12 M R <sub>9</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2895	16.73	
9	12 M R <sub>9</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2874	15.75	
10	12 M R <sub>10</sub> T R <sub>1</sub> M T <sub>3</sub> I .....	7.2648	19.81	
10	12 M R <sub>10</sub> T R <sub>1</sub> M T <sub>4</sub> O .....	7.2820	18.58	
10	12 M R <sub>10</sub> T R <sub>1</sub> M T <sub>5</sub> M .....	7.2808	19.18	
10	12 M R <sub>10</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.2848	16.07	
10	12 M R <sub>10</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.2855	16.15	
10	12 M R <sub>10</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.2865	16.07	
11	12 M R <sub>11</sub> T R <sub>2</sub> B L <sub>6</sub> I .....	7.3192	14.54	
11	12 M R <sub>11</sub> T R <sub>2</sub> B L <sub>7</sub> O .....	7.3119	14.40	
11	12 M R <sub>11</sub> T R <sub>2</sub> B L <sub>7</sub> x .....	7.3167	16.07	Upper end.
11	12 M R <sub>11</sub> T R <sub>2</sub> B L <sub>7</sub> xx .....	7.3185	15.83	Lower end.
11	12 M R <sub>11</sub> T R <sub>2</sub> B L <sub>8</sub> M .....	7.3224	14.69	

## STEEL HOOPS.

2	12 M R <sub>2</sub> B <sub>6</sub> R <sub>5</sub> M .....	7.8450	23.70	
4	12 M R <sub>4</sub> A <sub>3</sub> R <sub>4</sub> M .....	7.8373	23.70	
4	12 M R <sub>4</sub> B <sub>4</sub> R <sub>5</sub> M .....	7.8441	22.39	
5	12 M R <sub>5</sub> A <sub>4</sub> R <sub>4</sub> M .....	7.8459	21.89	
5	12 M R <sub>5</sub> B <sub>5</sub> R <sub>5</sub> M .....	7.8477	19.39	
6	12 M R <sub>6</sub> A <sub>4</sub> R <sub>4</sub> M .....	7.8433	23.43	
6	12 M R <sub>6</sub> B <sub>4</sub> R <sub>5</sub> M .....	7.8454	25.73	
7	12 M R <sub>7</sub> A <sub>5</sub> R <sub>4</sub> M .....	7.8425	22.77	
7	12 M R <sub>7</sub> B <sub>5</sub> R <sub>5</sub> M .....	7.8439	24.26	
8	12 M R <sub>8</sub> B <sub>1</sub> R <sub>9</sub> M .....	7.8445	23.03	
9	12 M R <sub>9</sub> A <sub>5</sub> R <sub>4</sub> M .....	7.8398	23.43	
9	12 M R <sub>9</sub> B <sub>1</sub> R <sub>5</sub> M .....	7.8386	22.39	
10	12 M R <sub>10</sub> B <sub>1</sub> R <sub>5</sub> M .....	7.8453	23.03	
11	12 M R <sub>11</sub> A <sub>4</sub> R <sub>4</sub> M .....	7.8416	21.29	
-----	12 M R <sub>11</sub> B <sub>5</sub> R <sub>5</sub> M .....	7.8436	22.02	
12	12 M R <sub>12</sub> A <sub>4</sub> R <sub>4</sub> M .....	7.8424	22.64	
18	12 M R <sub>13</sub> A <sub>3</sub> R <sub>4</sub> M .....	7.8457	22.01	

## 12-INCH B. L. RIFLED MORTARS.

## TABULATION OF SPECIMENS FROM HOOPS AND GAS CHECKS.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction area.	Appearance of fracture.	Specific gravity.	Hardness.
3917	Trunnion hoop, mortar No. 1	Outside	Pounds. 52 000	Pounds. 101 440	Per ct. 17.0	Per ct. 36.4	Granular, silky center		
3814	Trunnion hoop, mortar No. 2	do	53 000	101 440	16.3	36.4	do		
3928	Hoop A <sub>1</sub> , mortar No. 2	do	51 000	103 240	12.8	21.4	Granular, dull spot		
3929	Hoop A <sub>2</sub> , mortar No. 2	Middle	50 000	102 560	14.8	27.6	Granular, 80 per cent.; dull silky, 20 per cent.		
3930	Hoop A <sub>3</sub> , mortar No. 2	Inside	50 000	97 880	15.8	36.4	Granular, 15 per cent.; dull silky, 85 per cent.		
3924	Hoop B <sub>1</sub> , mortar No. 2	Outside	58 000	105 280	16.5	27.6	Granular		
3925	Hoop B <sub>2</sub> , mortar No. 2	Middle	51 000	101 040	15.3	33.5	Granular, dull silky spot		
3915	Hoop B <sub>3</sub> , mortar No. 2	Outside	57 000	106 440	14.8	30.6	Granular, silky spot		
3816	Gas check, mortar No. 2	do	73 000	133 840	12.0	21.4	do		
3817	Gas check, mortar No. 2	Middle	70 000	129 660	10.3	21.4	Granular, silky center		
3824	Trunnion hoop, mortar No. 3	Outside	54 000	105 040	13.3	24.6	Granular		
3926	Hoop A <sub>4</sub> , mortar No. 3	do	57 000	111 200	12.8	27.6	Granular, silky center		
3857	Hoop A <sub>5</sub> , mortar No. 3	do	60 000	106 040	17.3	41.9	Silky and granular		
3840	Hoop B <sub>1</sub> , mortar No. 3	do	57 000	108 160	15.8	33.5	Granular, silky center		
3927	Hoop B <sub>2</sub> , mortar No. 3	do	53 000	108 360	15.0	27.6	do		
3876	Hoop A <sub>3</sub> , mortar No. 4	do	59 000	107 920	14.0	27.6	do		
3879	Hoop A <sub>4</sub> , mortar No. 4	do	59 000	107 560	15.5	33.5	do		
3882	Hoop B <sub>1</sub> , mortar No. 4	do	57 000	103 920	17.3	36.4	Silky and granular		
3877	Hoop B <sub>2</sub> , mortar No. 4	do	61 000	108 760	15.3	33.5	Granular, silky center		
3875	Trunnion hoop, mortar No. 4	do	58 000	106 320	15.3	33.5	do		
3880	Gas check, mortar No. 4	do	75 000	138 080	12.3	18.3	Granular, with dull spot		
3881	Gas check, mortar No. 4	Middle	70 000	132 080	9.3	18.3	do		
3889	Hoop A <sub>4</sub> , mortar No. 5	Inside	54 000	99 520	16.5	36.4	Granular, silky center		
3975	Hoop A <sub>5</sub> , mortar No. 5	do	57 000	101 160	16.3	44.9	Silky and granular		
3922	Hoop B <sub>1</sub> , mortar No. 5	Outside	58 000	108 240	17.0	33.5	Granular, silky center		
3923	Trunnion hoop, mortar No. 5	do	55 000	99 920	17.3	41.9	Silky and granular		
3974	Hoop A <sub>4</sub> , mortar No. 6	do	59 000	102 040	17.8	44.6	do		
3916	Hoop B <sub>1</sub> , mortar No. 6	do	60 000	104 280	18.0	39.2	Silky and granular		
3841	Gas check, mortar No. 6	do	76 000	132 800	13.3	27.6	Granular, dull spot		
3842	Gas check, mortar No. 6	Middle	70 000	128 440	13.0	24.6	Granular, silky center	7.8425	22.77
4040	Hoop A <sub>6</sub> , mortar No. 7	Outside	60 000	109 060	16.0	30.6	do		
4079	Hoop B <sub>1</sub> , mortar No. 7	do	63 000	110 360	13.8	27.6	Granular, dull spot		
4145	Hoop B <sub>2</sub> , mortar No. 8	do	51 000	107 280	15.0	27.6	do		
4147	Hoop B <sub>3</sub> , mortar No. 8	do	55 000	109 920	14.0	27.6	Granular, silky center		
4148	Hoop B <sub>4</sub> , mortar No. 8	do	54 000	109 160	13.3	27.6	do		
4149	Hoop B <sub>5</sub> , mortar No. 8	Inside	53 000	107 880	15.0	24.6	Granular, dull spot		
4125	Hoop A <sub>4</sub> , mortar No. 9	Middle	54 000	107 880	17.5	36.4	Granular, silky center		
4144	Hoop A <sub>5</sub> , mortar No. 9	Outside	54 000	102 320	16.8	30.6	Granular, dull spot		
4142	Hoop B <sub>1</sub> , mortar No. 9	do	57 000	104 920	19.0	41.9	Silky and granular		



4128	Hoop A <sub>3</sub> , mortar No. 10	do	61,000	110,360	13.0	21.4	Granular, dull spot.
4163	Hoop A <sub>6</sub> , mortar No. 10	Middle	57,000	101,880	17.8	41.9	Silky and granular
4146	Hoop B <sub>1</sub> , mortar No. 10	Outside	57,000	100,680	16.8	36.4	Granular, 60 per cent.; silky, 40 per cent.
4143	Hoop A <sub>4</sub> , mortar No. 11	do	58,000	102,520	16.3	33.5	Granular, silky center.
4150	Hoop B <sub>6</sub> , mortar No. 11	do	55,000	103,280	18.0	41.9	Silky and granular
4151	Hoop A <sub>4</sub> , mortar No. 12	do	55,000	102,480	17.0	39.2	do
4154	Hoop B <sub>1</sub> , mortar No. 12	do	61,000	111,640	14.8	33.5	Granular, silky center.
4166	Hoop A <sub>3</sub> , mortar No. 13	Inside	59,000	101,640	17.8	47.2	Silky, trace of granular
4166	Hoop B <sub>1</sub> , mortar No. 13	Middle	53,000	100,120	17.5	41.9	Silky and granular
4155	Hoop A <sub>4</sub> , mortar No. 14	Outside	53,000	95,380	20.8	52.2	Silky
4261	Hoop B <sub>6</sub> , mortar No. 14	do	53,000	101,560	17.5	41.9	Silky and granular
4268	Hoop A <sub>3</sub> , mortar No. 15	Middle	63,000	112,480	14.8	33.5	Granular, silky center.
4282	Hoop B <sub>1</sub> , mortar No. 15	Outside	61,000	105,100	17.5	47.2	Silky
4285	Hoop A <sub>4</sub> , mortar No. 16	do	59,000	112,480	16.0	27.6	Granular, silky center.
4266	Hoop B <sub>1</sub> , mortar No. 16	do	54,000	104,680	17.3	39.2	do
4269	Hoop A <sub>4</sub> , mortar No. 17	do	61,000	109,960	15.5	33.2	Silky
4264	Hoop B <sub>1</sub> , mortar No. 17	do	61,000	109,440	15.5	33.5	Granular, silky spot.
4267	Hoop B <sub>1</sub> , mortar No. 18	do	62,000	111,120	15.3	33.5	Granular, silky center.

\* Below 50,000 pounds.

† Below 70,000 pounds.



---

---

ROUND, SQUARE, AND FLAT, TINNED AND UNTINNED,  
STEEL WIRE, ALSO ELECTRICALLY WELDED.

---

---



**ROUND STEEL RODS BEFORE DRAWING, SQUARE STEEL WIRE AT DIFFERENT STAGES OF DRAWING, AND .1-INCH SQUARE FINISHED TINNED STEEL WIRE, FROM J. A. ROEBLING'S SONS CO.**

SAMPLES FROM ENDS OF COILED RODS BEFORE DRAWING.

No. 3837.

Sample 1.

Diameter, ".216.

Sectional area, .036 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
180	5,000	0.	0.	0.	0.	Initial load.
720	20,000	.00058	.00058	.....	.....	
1,440	40,000	.00158	.00100	.....	.....	
1,800	50,000	.00248	.00090	.....	.....	
1,836	51,000	.00262	.00014	.....	.....	
1,872	52,000	.00278	.00016	.....	.....	
1,908	53,000	.00310	.00032	.....	.....	
1,944	54,000	.00328	.00018	.....	.....	
1,980	55,000	.00353	.00025	.....	.....	
2,016	56,000	.00380	.00027	.....	.....	
2,052	57,000	.00420	.00040	.....	.....	
2,088	58,000	.00477	.00057	.....	.....	
2,124	59,000	.00539	.00062	.....	.....	
2,160	60,000	.00618	.00079	.....	.....	
2,196	61,000	.00697	.00079	.....	.....	Elastic limit.
2,232	62,000	.00810	.00113	.....	.....	
2,268	63,000	.00925	.00115	.....	.....	
2,304	64,000	.011	.00175	.....	.....	
2,376	66,000	.014	.003	.....	.....	
2,448	68,000	.017	.003	.....	.....	
2,520	70,000	.018	.001	.....	.....	
2,592	72,000	.019	.001	.....	.....	
2,664	74,000	.020	.001	.....	.....	
2,736	76,000	.022	.002	.....	.....	
2,808	78,000	.024	.002	.....	.....	
2,880	80,000	.027	.003	.....	.....	
2,952	82,000	.030	.003	.....	.....	
3,024	84,000	.032	.002	.....	.....	
3,096	86,000	.034	.002	.....	.....	
3,168	88,000	.037	.003	.....	.....	
3,240	90,000	.041	.004	.....	.....	
3,312	92,000	.046	.005	.....	.....	
3,384	94,000	.050	.004	.....	.....	
3,456	96,000	.053	.003	.....	.....	
3,528	98,000	.061	.008	.....	.....	
3,600	100,000	.068	.007	.....	.....	
3,672	102,000	.078	.010	.....	.....	
3,734	103,720	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	103,720
Elastic limit per square inch of original section .....	do..	56,000
Elongation per inch after rupture .....	inch..	.096
Elongation per inch under strain at elastic limit .....	do..	.00380
Reduction in diameter at point of rupture .....	do..	.046
Reduction in area after rupture, per centum of original section .....		36.1
Position of rupture .....	3".75 inside the gauged section	
Character of broken surface .....	fine silky	

No. 3838.

Sample 2.

Diameter, ".220.

Sectional area, .038 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
190	5,000	0.	0.	0.	0.	Initial load.
760	20,000	.00064	.00064	.....	.....	
1,520	40,000	.00158	.00094	.....	.....	
1,900	50,000	.00237	.00079	.....	.....	
1,938	51,000	.00249	.00012	.....	.....	
1,976	52,000	.00256	.00007	.....	.....	
2,014	53,000	.00262	.00006	.....	.....	
2,052	54,000	.00273	.00011	.....	.....	
2,090	55,000	.00278	.00005	.....	.....	
2,128	56,000	.00289	.00011	.....	.....	
2,166	57,000	.00310	.00021	.....	.....	Elastic limit.
2,204	58,000	.00328	.00018	.....	.....	
2,242	59,000	.00348	.00020	.....	.....	
2,280	60,000	.00363	.00015	.....	.....	
2,318	61,000	.00390	.00027	.....	.....	
2,356	62,000	.00420	.00030	.....	.....	
2,394	63,000	.00460	.00040	.....	.....	
2,432	64,000	.00510	.00050	.....	.....	
2,470	65,000	.00630	.00120	.....	.....	
2,508	66,000	.008	.00170	.....	.....	
2,584	68,000	.019	.011	.....	.....	Tensile strength.
2,660	70,000	.022	.003	.....	.....	
2,812	74,000	.024	.002	.....	.....	
2,964	78,000	.030	.006	.....	.....	
3,116	82,000	.036	.006	.....	.....	
3,268	86,000	.041	.005	.....	.....	
3,420	90,000	.051	.010	.....	.....	
3,572	94,000	.063	.012	.....	.....	
3,724	98,000	.070	.007	.....	.....	
3,890	100,000	.085	.015	.....	.....	
3,876	102,000	.100	.015	.....	.....	
3,890	102,390	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	102,390
Elastic limit per square inch of original section.....	do...	60,000
Elongation per inch after rupture.....	inch..	.120
Elongation per inch under strain at elastic limit.....	do...	.00363
Reduction in diameter at point of rupture.....	do...	.060
Reduction in area after rupture, per centum of original section.....		47.4
Position of rupture.....	2".35 inside the gauged section	
Character of broken surface.....	fine silky	

No. 3839.

Sample 3.

Diameter, ".212.

Sectional area, .035 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
175	5,000	0.	0.	0.	0.	Initial load.
700	20,000	.00061	.00061	.....	.....	
1,400	40,000	.00187	.00128	.....	.....	
1,750	50,000	.00321	.00134	.....	.....	
1,785	51,000	.00344	.00023	.....	.....	
1,820	52,000	.00361	.00017	.....	.....	Elastic limit.
1,855	53,000	.00388	.00027	.....	.....	
1,890	54,000	.00418	.00030	.....	.....	
1,925	55,000	.00466	.00048	.....	.....	
1,960	56,000	.00510	.00044	.....	.....	
1,995	57,000	.00544	.00034	.....	.....	
2,030	58,000	.00595	.00051	.....	.....	
2,066	59,000	.00671	.00076	.....	.....	
2,100	60,000	.00761	.00090	.....	.....	
2,135	61,000	.00847	.00086	.....	.....	
2,170	62,000	.00912	.00065	.....	.....	
2,240	64,000	.012	.00288	.....	.....	
2,310	66,000	.014	.002	.....	.....	
2,450	68,000	.017	.003	.....	.....	
2,590	70,000	.021	.004	.....	.....	
2,730	74,000	.024	.003	.....	.....	Tensile strength.
2,870	78,000	.028	.004	.....	.....	
3,010	82,000	.032	.004	.....	.....	
3,150	86,000	.038	.006	.....	.....	
3,290	90,000	.047	.009	.....	.....	
3,430	94,000	.053	.006	.....	.....	
3,500	98,000	.061	.008	.....	.....	
3,570	100,000	.068	.007	.....	.....	
3,640	102,000	.082	.014	.....	.....	
3,685	105,290	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section .....	pounds..	105,290
Elastic limit per square inch of original section .....	do..	54,000
Elongation per inch after rupture .....	inch..	.097
Elongation per inch under strain at elastic limit .....	do..	.00418
Reduction in diameter at point of rupture .....	do..	.052
Reduction in area after rupture, per centum of original section .....		42.9
Position of rupture .....	3/4 inside the gauged section	
Character of broken surface .....	fine, silky	

H, Ex. 165—28

No. 3840.

Sample 4.

Diameter, ".220.

Sectional area, .038 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
190	5,000	0.	0.	0.	0.	
760	20,000	.00058	.00058	.....	.....	
1,520	40,000	.00141	.00083	.....	.....	
1,900	50,000	.00187	.00046	.....	.....	
1,938	51,000	.00198	.00011	.....	.....	
1,976	52,000	.00208	.00010	.....	.....	
2,014	53,000	.00212	.00004	.....	.....	
2,052	54,000	.00218	.00006	.....	.....	
2,090	55,000	.00223	.00005	.....	.....	
2,128	56,000	.00231	.00008	.....	.....	
2,166	57,000	.00240	.00009	.....	.....	
2,204	58,000	.00248	.00008	.....	.....	
2,242	59,000	.00255	.00007	.....	.....	
2,280	60,000	.00268	.00013	.....	.....	
2,318	61,000	.00278	.00010	.....	.....	
2,356	62,000	.00285	.00007	.....	.....	
2,394	63,000	.00293	.00008	.....	.....	
2,432	64,000	.00310	.00017	.....	.....	
2,470	65,000	.00320	.00010	.....	.....	
2,508	66,000	.00331	.00011	.....	.....	Elastic limit.
2,546	67,000	.00348	.00017	.....	.....	
2,584	68,000	.00363	.00015	.....	.....	
2,622	69,000	.00382	.00019	.....	.....	
2,660	70,000	.00408	.00026	.....	.....	
2,698	71,000	.00434	.00026	.....	.....	
2,736	72,000	.00468	.00034	.....	.....	
2,774	73,000	.00510	.00042	.....	.....	
2,812	74,000	.00583	.00073	.....	.....	
2,850	75,000	.00790	.00207	.....	.....	
2,888	76,000	.01470	.00680	.....	.....	Tensile strength.
2,964	78,000	.031	.0163	.....	.....	
3,116	82,000	.037	.006	.....	.....	
3,268	86,000	.043	.006	.....	.....	
3,420	90,000	.053	.010	.....	.....	
3,572	94,000	.068	.015	.....	.....	
3,724	98,000	.092	.024	.....	.....	
3,800	100,000	.120	.028	.....	.....	
3,810	100,260	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 100, 260  
 Elastic limit per square inch of original section ..... do .. 66, 000  
 Elongation per inch after rupture ..... inch.. 0. 142  
 Elongation per inch under strain at elastic limit ..... do .. .00331  
 Reduction in diameter at point of rupture ..... do .. .065  
 Reduction in area after rupture, per centum of original section ..... 50. 3  
 Position of rupture ..... 3". 3 inside the gauged section  
 Character of broken surface ..... fine, silky



No. 3841.

Sample 5.

Diameter, ".218.

Sectional area, .037 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square. inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
185	5,000	0.	0.	0.	0.	Initial load.
740	20,000	.00069	.00069	.....	.....	
1,480	40,000	.00177	.00108	.....	.....	
1,880	50,000	.00283	.00106	.....	.....	
1,887	51,000	.00296	.00013	.....	.....	
1,924	52,000	.00310	.00014	.....	.....	
1,961	53,000	.00330	.00020	.....	.....	
1,998	54,000	.00342	.00012	.....	.....	
2,085	55,000	.00355	.00013	.....	.....	
2,072	56,000	.00398	.00043	.....	.....	Elastic limit.
2,109	57,000	.00428	.00030	.....	.....	
2,146	58,000	.00478	.00050	.....	.....	
2,183	59,000	.00510	.00032	.....	.....	
2,220	60,000	.00576	.00066	.....	.....	
2,257	61,000	.00618	.00042	.....	.....	
2,294	62,000	.00680	.00062	.....	.....	
2,331	63,000	.00770	.00090	.....	.....	
2,368	64,000	.00830	.00060	.....	.....	
2,405	65,000	.00895	.00065	.....	.....	
2,442	66,000	.00947	.00052	.....	.....	
2,479	67,000	.01013	.00066	.....	.....	
2,516	68,000	.01065	.00072	.....	.....	
2,590	70,000	.013	.00215	.....	.....	
2,738	74,000	.018	.005	.....	.....	
2,880	78,000	.020	.002	.....	.....	
3,054	82,000	.023	.003	.....	.....	
3,182	86,000	.027	.004	.....	.....	
3,330	90,000	.030	.003	.....	.....	
3,478	94,000	.036	.006	.....	.....	
3,626	98,000	.042	.006	.....	.....	
3,700	100,000	.048	.006	.....	.....	
3,774	102,000	.053	.005	.....	.....	
3,848	104,000	.056	.003	.....	.....	
3,922	106,000	.064	.008	.....	.....	
3,996	108,000	.075	.011	.....	.....	
4,070	110,000	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 110,000  
 Elastic limit per square inch of original section.....do... 55,000  
 Elongation per inch after rupture.....inch... .082  
 Elongation per inch under strain at elastic limit.....do... .00355  
 Reduction in diameter at point of rupture.....do... .033  
 Reduction in area after rupture, per centum of original section.....27.3  
 Position of rupture.....at end of gauged section.  
 Character of broken surface.....granular, 60 per cent.; silky, 40 per cent.

No. 3842.

Sample 6.

Diameter, ".212.

Sectional area, .035 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
185	5,000	0.	0.	0.	0.	
700	20,000	.00059	.00059	.....	.....	
1,400	40,000	.00139	.00080	.....	.....	
1,750	50,000	.00205	.00066	.....	.....	
1,785	51,000	.00210	.00005	.....	.....	
1,820	52,000	.00217	.00007	.....	.....	
1,855	53,000	.00223	.00006	.....	.....	
1,890	54,000	.00230	.00007	.....	.....	
1,925	55,000	.00240	.00010	.....	.....	
1,960	56,000	.00250	.00010	.....	.....	
1,995	57,000	.00260	.00010	.....	.....	
2,030	58,000	.00266	.00006	.....	.....	
2,065	59,000	.00278	.00012	.....	.....	
2,100	60,000	.00290	.00012	.....	.....	
2,135	61,000	.00302	.00012	.....	.....	
2,170	62,000	.00312	.00010	.....	.....	
2,205	63,000	.00329	.00017	.....	.....	
2,240	64,000	.00350	.00021	.....	.....	
2,275	65,000	.00363	.00013	.....	.....	
2,310	66,000	.00380	.00017	.....	.....	Elastic limit.
2,345	67,000	.00410	.00030	.....	.....	
2,380	68,000	.00444	.00034	.....	.....	
2,415	69,000	.00482	.00038	.....	.....	
2,450	70,000	.00527	.00045	.....	.....	
2,485	71,000	.00565	.00038	.....	.....	
2,520	72,000	.00646	.00081	.....	.....	
2,555	73,000	.00768	.00122	.....	.....	
2,590	74,000	.010	.00232	.....	.....	
2,730	78,000	.023	.013	.....	.....	
2,870	82,000	.025	.002	.....	.....	Tensile strength.
3,010	86,000	.030	.005	.....	.....	
3,150	90,000	.034	.004	.....	.....	
3,290	94,000	.041	.007	.....	.....	
3,430	98,000	.047	.006	.....	.....	
3,503	100,000	.052	.005	.....	.....	
3,570	102,000	.057	.005	.....	.....	
3,640	104,000	.062	.005	.....	.....	
3,710	106,000	.072	.010	.....	.....	
3,780	108,000	.083	.011	.....	.....	
3,850	110,000	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	110,000
Elastic limit per square inch of original section .....	do ..	66,000
Elongation per inch after rupture .....	inch..	.092
Elongation per inch under strain at elastic limit .....	do ..	.00380
Reduction in diameter at point of rupture .....	do ..	.052
Reduction in area after rupture, per centum of original section .....		42.6
Position of rupture .....	1".85 outside the gauged section.	
Character of broken surface .....	fine, silky.	

No. 3843.

Sample 7.

Diameter, ".218.

Sectional area, .037 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
185	5,000	0.	0.	0.	0.	
740	20,000	.00066	.00066	.....	.....	
1,480	40,000	.00142	.00076	.....	.....	
1,850	50,000	.00190	.00048	.....	.....	
2,220	60,000	.00248	.00058	.....	.....	
2,257	61,000	.00258	.00010	.....	.....	
2,294	62,000	.00269	.00011	.....	.....	
2,331	63,000	.00278	.00009	.....	.....	
2,368	64,000	.00288	.00010	.....	.....	
2,405	65,000	.00298	.00010	.....	.....	
2,442	66,000	.00310	.00012	.....	.....	
2,479	67,000	.00321	.00011	.....	.....	
2,516	68,000	.00332	.00011	.....	.....	Elastic limit.
2,553	69,000	.00350	.00018	.....	.....	
2,590	70,000	.00371	.00021	.....	.....	
2,627	71,000	.00388	.00017	.....	.....	
2,664	72,000	.00407	.00019	.....	.....	
2,701	73,000	.00438	.00031	.....	.....	
2,738	74,000	.00468	.00020	.....	.....	
2,775	75,000	.00511	.00043	.....	.....	
2,812	76,000	.00580	.00069	.....	.....	
2,846	78,000	.01420	.00840	.....	.....	
2,960	80,000	.034	.0198	.....	.....	
3,108	84,000	.041	.007	.....	.....	
3,256	88,000	.048	.007	.....	.....	
3,404	92,000	.058	.010	.....	.....	
3,552	96,000	.069	.011	.....	.....	
3,700	100,000	.089	.020	.....	.....	
3,816	103,140	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 103,140  
 Elastic limit per square inch of original section ..... do... 68,000  
 Elongation per inch after rupture ..... inch... .724  
 Elongation per inch under strain at elastic limit ..... do... .00332  
 Reduction in diameter at point of rupture ..... do... .068  
 Reduction in area after rupture, per centum of original section ..... 52.2  
 Position of rupture ..... 2".70 outside the gauged section  
 Character of broken surface ..... fine silky

No. 3844.

Sample 8.

Diameter, ".225.

Sectional area, .039 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
195	5,000	0.	0.	0.	0.	Initial load.
780	20,000	.00061	.00061	.....	.....	
1,560	40,000	.00153	.00092	.....	.....	
1,950	50,000	.00217	.00064	.....	.....	
2,340	60,000	.00323	.00166	.....	.....	
2,379	61,000	.00336	.00013	.....	.....	
2,418	62,000	.00362	.00026	.....	.....	
2,457	63,000	.00377	.00015	.....	.....	
2,496	64,000	.00405	.00028	.....	.....	
2,535	65,000	.00448	.00043	.....	.....	Elastic limit.
2,574	66,000	.00482	.00034	.....	.....	
2,613	67,000	.00560	.00078	.....	.....	
2,652	68,000	.00603	.00042	.....	.....	
2,691	69,000	.00767	.00164	.....	.....	
2,730	70,000	.01085	.00318	.....	.....	
2,886	74,000	.021	.01015	.....	.....	
3,042	78,000	.027	.006	.....	.....	
3,198	82,000	.031	.001	.....	.....	
3,354	86,000	.037	.006	.....	.....	Tensile strength.
3,510	90,000	.042	.005	.....	.....	
3,666	94,000	.052	.010	.....	.....	
3,822	98,000	.067	.015	.....	.....	
3,900	100,000	.075	.008	.....	.....	
3,978	102,000	.090	.015	.....	.....	
4,056	104,000	.140	.050	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 104,000  
 Elastic limit per square inch of original section..... do .. 63,000  
 Elongation per inch after rupture..... inch.. .142  
 Elongation per inch under strain at elastic limit..... do... .00377  
 Reduction in diameter at point of rupture..... do... .055  
 Reduction in area after rupture, per centum of original section..... 41.8  
 Position of rupture..... ".25 inside the gauged length  
 Character of broken surface ..... fine silky

No. 3845.

Sample 9.

Diameter, ".217.

Sectional area, .037 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
185	5,000	0.	0.	0.	0.	Initial load.
740	20,000	.00065	.00065	.....	.....	
1,480	40,000	.00157	.00092	.....	.....	
1,850	50,000	.00225	.00068	.....	.....	
2,220	60,000	.00324	.00099	.....	.....	
2,257	61,000	.00331	.00007	.....	.....	
2,294	62,000	.00341	.00010	.....	.....	
2,331	63,000	.00359	.00018	.....	.....	Elastic limit.
2,368	64,000	.00379	.00020	.....	.....	
2,405	65,000	.00403	.00024	.....	.....	
2,442	66,000	.00435	.00032	.....	.....	
2,479	67,000	.00463	.00028	.....	.....	
2,516	68,000	.00513	.00050	.....	.....	
2,553	69,000	.00577	.00064	.....	.....	
2,590	70,000	.00814	.00237	.....	.....	
2,738	74,000	.021	.01286	.....	.....	
2,886	78,000	.026	.005	.....	.....	
3,034	82,000	.031	.005	.....	.....	
3,182	86,000	.036	.005	.....	.....	
3,330	90,000	.041	.005	.....	.....	
3,478	94,000	.049	.008	.....	.....	
3,626	98,000	.062	.013	.....	.....	
3,700	100,000	.070	.008	.....	.....	
3,774	102,000	.082	.012	.....	.....	
3,848	104,000	.099	.017	.....	.....	
3,897	105,320	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....	pounds..	105,320
Elastic limit per square inch of original section.....	do..	62,000
Elongation per inch after rupture.....	inch..	.130
Elongation per inch under strain at elastic limit.....	do..	.00341
Reduction in diameter at point of rupture.....	do..	.047
Reduction in area after rupture, per centum of original section.....		38.7
Position of rupture.....	at middle of length	
Character of broken surface.....	fine silky	

No. 3846.

Sample 10.

Diameter, ".218.

Sectional area, .037 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
185	5,000	0.	0.	0.	0.	
740	20,000	.00059	.00059	.....	.....	
1,480	40,000	.00139	.00080	.....	.....	
1,850	50,000	.00182	.00043	.....	.....	
2,220	60,000	.00240	.00058	.....	.....	
2,257	61,000	.00247	.00007	.....	.....	
2,294	62,000	.00252	.00005	.....	.....	
2,331	63,000	.00260	.00008	.....	.....	
2,368	64,000	.00266	.00006	.....	.....	
2,405	65,000	.00272	.00006	.....	.....	
2,442	66,000	.00280	.00008	.....	.....	
2,479	67,000	.00288	.00008	.....	.....	
2,516	68,000	.00295	.00007	.....	.....	
2,553	69,000	.00306	.00011	.....	.....	
2,590	70,000	.00311	.00005	.....	.....	
2,627	71,000	.00326	.00015	.....	.....	
2,664	72,000	.00333	.00007	.....	.....	
2,701	73,000	.00343	.00010	.....	.....	
2,738	74,000	.00354	.00011	.....	.....	Elastic limit, approxi- mate.
2,775	75,000	.00369	.00015	.....	.....	
2,812	76,000	.00387	.00018	.....	.....	
2,849	77,000	.00401	.00014	.....	.....	
2,886	78,000	.00433	.00032	.....	.....	
2,923	79,000	.00451	.00018	.....	.....	
2,960	80,000	.00491	.00040	.....	.....	
2,997	81,000	.00561	.00070	.....	.....	
3,034	82,000	.00760	.00199	.....	.....	
3,182	86,000	.024	.0164	.....	.....	
3,330	90,000	.030	.006	.....	.....	
3,478	94,000	.034	.004	.....	.....	
3,626	98,000	.041	.007	.....	.....	
3,700	100,000	.043	.002	.....	.....	
3,774	102,000	.048	.005	.....	.....	
3,848	104,000	.053	.005	.....	.....	
3,922	106,000	.058	.005	.....	.....	
4,070	110,000	.073	.015	.....	.....	
4,218	114,000	.110	.037	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	114,000
Elastic limit per square inch of original section (approximate) .....	do..	74,000
Elongation per inch after rupture .....	inch..	.118
Elongation per inch under strain at elastic limit .....	do..	.00354
Reduction in diameter at point of rupture .....	do..	.043
Reduction in area after rupture, per centum of original section .....		38.7
Position of rupture .....	".1 outside the gauged section	
Character of broken surface .....	fine silky	

## SAMPLES FROM ENDS OF COILS AFTER SECOND DRAWING.

No. 3807.

Sample 1.

Sectional area,  $''1496 \times ''1503 = .022$  square inch.

Gauged length, 10''.

Applied loads.		Elongation. per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
110	5,000	0.	0.	0.	0.	Initial load.
440	20,000	.00075	.00075			
880	40,000	.00172	.00097			
1,320	60,000	.00284	.00112			
1,430	65,000	.00314	.00030			Elastic limit.
1,540	70,000	.00351	.00037			
1,650	75,000	.00382	.00041			
1,760	80,000	.00442	.00050			
1,870	85,000	.00506	.00064			
1,980	90,000	.00601	.00095			
2,090	95,000	.00722	.00121			
2,200	100,000	.01114	.00392			
2,245	102,040					Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 102,040  
 Elastic limit per square inch of original section.....do .. 70,000  
 Elongation per inch after rupture .....inch.. .010  
 Elongation per inch under strain at elastic limit .....do... .00351  
 Reduction in area after rupture, per centum of original section..... 54.5  
 Position of rupture .....5''.95 outside the gauged section  
 Character of broken surface .....fine silky

No. 3808.

*Sample 2.*Sectional area,  $".1515 \times ".1513 = .0229$  square inch.Gauged length,  $10''$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
114	5,000	0.	0.	0.	0.	Initial load.
458	20,000	.00073	.00073	.....	.....	
916	40,000	.00171	.00098	.....	.....	
1,374	60,000	.00287	.00116	.....	.....	
1,488	65,000	.00323	.00036	.....	.....	Elastic limit.
1,603	70,000	.00365	.00042	.....	.....	
1,717	75,000	.00422	.00057	.....	.....	
1,832	80,000	.00480	.00058	.....	.....	
1,946	85,000	.00583	.00103	.....	.....	
2,061	90,000	.00767	.00184	.....	.....	
2,175	95,000	.01417	.00650	.....	.....	
2,214	96,680	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	96,680
Elastic limit per square inch of original section .....	do.	65,000
Elongation per inch after rupture .....	inch..	.017
Elongation per inch under strain at elastic limit .....	do.	.00323
Reduction in area after rupture, per centum of original section .....		55.9
Position of rupture .....	1".3 outside the gauged section	
Character of broken surface .....	fine, silky	

No. 3809.

*Sample 3.*Sectional area,  $".1505 \times ".1495 = .0225$  square inch.Gauged length,  $10''$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
112	5,000	0.	0.	0.	0.	Initial load.
450	20,000	.00072	.00072	.....	.....	
900	40,000	.00166	.00094	.....	.....	
1,350	60,000	.00278	.00112	.....	.....	
1,462	65,000	.00308	.00030	.....	.....	Elastic limit.
1,575	70,000	.00343	.00035	.....	.....	
1,687	75,000	.00388	.00045	.....	.....	
1,800	80,000	.00441	.00053	.....	.....	
1,912	85,000	.00521	.00080	.....	.....	
2,025	90,000	.00637	.00116	.....	.....	
2,137	95,000	.00908	.00271	.....	.....	
2,215	98,440	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	98,440
Elastic limit per square inch of original section .....	do.	70,000
Elongation per inch after rupture .....	inch..	.006
Elongation per inch under strain at elastic limit .....	do.	.00343
Reduction in area after rupture, per centum of original section .....		55.6
Position of rupture .....	5".4 outside the gauged section	
Character of broken surface .....	fine, silky	



No. 3810.

Sample 4.

Sectional area,  $".1515 \times ".1514 = .0229$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
114	5,000	0.	0.	0.	0.	Initial load.
458	20,000	.00068	.00068	.....	.....	
916	40,000	.00148	.00080	.....	.....	
1,374	60,000	.00257	.00109	.....	.....	
1,488	65,000	.00289	.00032	.....	.....	
1,603	70,000	.00318	.00029	.....	.....	
1,717	75,000	.00354	.00036	.....	.....	
1,832	80,000	.00402	.00048	.....	.....	Elastic limit.
1,946	85,000	.00458	.00056	.....	.....	
2,061	90,000	.00544	.00086	.....	.....	
2,175	95,000	.00710	.00166	.....	.....	
2,290	100,000	.009	.0019	.....	.....	
2,362	103,140	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	103,140
Elastic limit per square inch of original section .....	do...	75,000
Elongation per inch after rupture .....	inch..	.035
Elongation per inch under strain at elastic limit .....	do...	.00354
Reduction in area after rupture, per centum of original section .....		55.4
Position of rupture .....	2".25 inside the gauged section	
Character of broken surface .....	fine silky	

No. 3811.

Sample 5.

Sectional area,  $".1500 \times ".1505 = .0225$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
112	5,000	0.	0.	0.	0.	Initial load.
450	20,000	.00090	.00090	.....	.....	
900	40,000	.00180	.00090	.....	.....	
1,350	60,000	.00288	.00108	.....	.....	
1,462	65,000	.00317	.00029	.....	.....	
1,575	70,000	.00348	.00031	.....	.....	
1,687	75,000	.00380	.00032	.....	.....	
1,800	80,000	.00420	.00040	.....	.....	
1,912	85,000	.00467	.00047	.....	.....	Elastic limit.
2,025	90,000	.00520	.00053	.....	.....	
2,137	95,000	.00598	.00078	.....	.....	
2,250	100,000	.00696	.00098	.....	.....	
2,362	105,000	.00858	.00162	.....	.....	
2,420	107,560	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	107,560
Elastic limit per square inch of original section .....	do...	80,000
Elongation per inch after rupture .....	inch..	.003
Elongation per inch under strain at elastic limit .....	do...	.00420
Reduction in area after rupture, per centum of original section .....		30.7
Position of rupture .....	10".75 outside the gauged section	
Character of broken surface .....	fine silky	

No. 3812.

Sample 6.

Sectional area,  $".1512 \times ".1506 = .0228$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
114	5,000	0.	0.	0.	0.	Initial load.
450	20,000	.00068	.00068	.....	.....	
912	40,000	.00166	.00098	.....	.....	
1,368	60,000	.00270	.00104	.....	.....	
1,482	65,000	.00294	.00024	.....	.....	Elastic limit.
1,596	70,000	.00340	.00046	.....	.....	
1,710	75,000	.00383	.00043	.....	.....	
1,824	80,000	.00432	.00049	.....	.....	
1,938	85,000	.00509	.00077	.....	.....	
2,052	90,000	.00602	.00093	.....	.....	
2,166	95,000	.00820	.00218	.....	.....	
2,280	100,000	.012	.0038	.....	.....	
2,318	101,670	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 101,670  
 Elastic limit per square inch of original section ..... do .. 65,000  
 Elongation per inch after rupture ..... inch.. .017  
 Elongation per inch under strain at elastic limit ..... do .. .00294  
 Reduction in area after rupture, per centum of original section ..... 56.1  
 Position of rupture ..... 3".6 outside the gauged section  
 Character of broken surface ..... fine, silky  
 There was a short twist in the wire at the place where rupture occurred.

No. 2813.

Sample 7.

Sectional area,  $".1505 \times ".1503 = .0226$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
113	5,000	0.	0.	0.	0.	Initial load.
452	20,000	.00072	.00072	.....	.....	
904	40,000	.00172	.00100	.....	.....	
1,356	60,000	.00280	.00108	.....	.....	
1,489	65,000	.00306	.00026	.....	.....	
1,582	70,000	.00337	.00031	.....	.....	
1,695	75,000	.00373	.00036	.....	.....	Elastic limit.
1,808	80,000	.00419	.00046	.....	.....	
1,921	85,000	.00464	.00045	.....	.....	
2,034	90,000	.00525	.00061	.....	.....	
2,147	95,000	.00625	.00100	.....	.....	
2,260	100,000	.00810	.00185	.....	.....	
2,373	105,000	.012	.0039	.....	.....	
2,422	107,170	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 107,170  
 Elastic limit per square inch of original section ..... do .. 75,000  
 Elongation per inch after rupture ..... inch.. .007  
 Elongation per inch under strain at elastic limit ..... do .. .00373  
 Reduction in area after rupture, per centum of original section ..... 58.4  
 Position of rupture ..... 8" outside the gauged section  
 Character of broken surface ..... fine, silky

## No. 3814.

## Sample 8.

Sectional area,  $".1493 \times ".1494 = .0223$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
111	5,000	0.	0.	0.	0.	Initial load.
446	20,000	.00078	.00078	.....	.....	
892	40,000	.00172	.00094	.....	.....	
1,338	60,000	.00278	.00106	.....	.....	
1,449	65,000	.00322	.00044	.....	.....	Elastic limit.
1,561	70,000	.00360	.00038	.....	.....	
1,672	75,000	.00408	.00018	.....	.....	
1,784	80,000	.00472	.00064	.....	.....	
1,895	85,000	.00562	.00090	.....	.....	
2,007	90,000	.00721	.00159	.....	.....	
2,118	95,000	.01080	.00359	.....	.....	Tensile strength.
2,190	98,210	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 98,210  
Elastic limit per square inch of original section.....do.. 70,000  
Elongation per inch after rupture.....inch.. .017  
Elongation per inch under strain at elastic limit.....do.. .00360  
Reduction in area after rupture, per centum of original section.....56.1  
Position of rupture.....2" outside the gauged section  
Character of broken surface.....fine silky

## No. 3815.

## Sample 9.

Sectional area,  $".1514 \times ".1513 = .0229$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
114	5,000	0.	0.	0.	0.	Initial load.
458	20,000	.00068	.00068	.....	.....	
916	40,000	.00147	.00079	.....	.....	
1,374	60,000	.00229	.00082	.....	.....	
1,488	65,000	.00250	.00021	.....	.....	Elastic limit.
1,603	70,000	.00278	.00028	.....	.....	
1,717	75,000	.00305	.00027	.....	.....	
1,832	80,000	.00339	.00034	.....	.....	
1,946	85,000	.00376	.00037	.....	.....	
2,061	90,000	.00429	.00053	.....	.....	
2,175	95,000	.00503	.00074	.....	.....	Tensile strength.
2,290	100,000	.00619	.00116	.....	.....	
2,404	105,000	.00875	.00256	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 105,000  
Elastic limit per square inch of original section.....do.. 85,000  
Elongation per inch after rupture.....inch.. .003  
Elongation per inch under strain at elastic limit.....do.. .00376  
Reduction in area after rupture, per centum of original section.....47.2  
Position of rupture.....2".75 outside the gauged section  
Character of broken surface.....fine, silky

No. 3816.

Sample 10.

Sectional area,  $".1500 \times ".1487 = .0223$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
111	5,000	0.	0.	0.	0.	Initial load.
446	20,000	.00073	.00073	-----	-----	
892	40,000	.00167	.00094	-----	-----	
1,338	60,000	.00274	.00107	-----	-----	
1,449	65,000	.00303	.00029	-----	-----	
1,561	70,000	.00340	.00037	-----	-----	Elastic limit.
1,672	75,000	.00382	.00042	-----	-----	
1,784	80,000	.00423	.00041	-----	-----	
1,895	85,000	.00483	.00060	-----	-----	
2,007	90,000	.00540	.00057	-----	-----	
2,118	95,000	.00680	.00140	-----	-----	Tensile strength.
2,230	100,000	.00906	.00226	-----	-----	
2,341	105,000	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 105,000  
 Elastic limit per square inch of original section.....do... 70,000  
 Elongation per inch after rupture.....inch... .015  
 Elongation per inch under strain at elastic limit.....do... .00340  
 Reduction in area after rupture, per centum of original section.....53.4  
 Position of rupture.....".75 inside the gauged section  
 Character of broken surface.....fine, silky

SAMPLES FROM ENDS OF COILS AFTER 3D DRAWING, 1ST HOLE.

No. 3817.

Sample 1.

Sectional area,  $".1170 \times ".1172 = .0137$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
08	5,000	0.	0.	0.	0.	
274	20,000	.00075	.00075	.....	.....	
548	40,000	.00163	.00088	.....	.....	
822	60,000	.00263	.00100	.....	.....	
1,096	80,000	.00371	.00108	.....	.....	
1,164	85,000	.00398	.00027	.....	.....	
1,233	90,000	.00430	.00032	.....	.....	
1,301	95,000	.00463	.00033	.....	.....	
1,370	100,000	.00508	.00045	.....	.....	
1,438	105,000	.00547	.00039	.....	.....	Elastic limit.
1,507	110,000	.00591	.00044	.....	.....	
1,575	115,000	.00641	.00050	.....	.....	
1,644	120,000	.00700	.00059	.....	.....	
1,712	125,000	.00763	.00063	.....	.....	
1,781	130,000	.00848	.00085	.....	.....	
1,849	135,000	.00965	.00117	.....	.....	
1,918	140,000	.01141	.00176	.....	.....	
1,986	145,000	.016	.00459	.....	.....	
2,055	150,000	.021	.005	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 150,000  
 Elastic limit per square inch of original section.....do... 105,000  
 Elongation per inch after rupture.....inch... .011  
 Elongation per inch under strain at elastic limit.....do... .00547  
 Reduction in area after rupture, per centum of original section.....40.9  
 Position of rupture.....2" outside the gauged length  
 Character of broken surface.....fine, silky

No. 3818.

Sample 2.

Sectional area,  $".1178 \times ".1172 = .0137$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
68	5,000	0.	0.	0.	0.	Initial load.
274	20,000	.00077	.00077	.....	.....	
548	40,000	.00162	.00085	.....	.....	
822	60,000	.00267	.00105	.....	.....	
1,096	80,000	.00363	.00096	.....	.....	
1,164	85,000	.00392	.00029	.....	.....	
1,233	90,000	.00424	.00032	.....	.....	
1,301	95,000	.00461	.00037	.....	.....	
1,370	100,000	.00499	.00038	.....	.....	
1,438	105,000	.00542	.00043	.....	.....	Elastic limit.
1,507	110,000	.00591	.00049	.....	.....	
1,575	115,000	.00646	.00055	.....	.....	
1,644	120,000	.00712	.00066	.....	.....	
1,712	125,000	.00784	.00072	.....	.....	
1,781	130,000	.00874	.00090	.....	.....	
1,849	135,000	.01007	.00133	.....	.....	
1,918	140,000	.014	.00393	.....	.....	
1,986	145,000	.017	.003	.....	.....	
2,050	149,640	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section..... pounds.. 149,640  
 Elastic limit per square inch of original section..... do... 100,000  
 Elongation per inch after rupture..... inch.. .012  
 Elongation per inch under strain at elastic limit..... do... .00499  
 Reduction in area after rupture, per centum of original section..... 32.8  
 Position of rupture..... 2".9 outside the gauged length  
 Character of broken surface..... fine, silky

No. 3819:

Sample 3.

Sectional area,  $".1179 \times ".1179 = .0139$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
89	5,000	0.	0.	0.	0.	Initial load.
278	20,000	.00075	.00075	.....	.....	
556	40,000	.00167	.00092	.....	.....	
834	60,000	.00258	.00091	.....	.....	
1,112	80,000	.00368	.00110	.....	.....	
1,181	85,000	.00388	.00020	.....	.....	
1,251	90,000	.00423	.00035	.....	.....	
1,320	95,000	.00460	.00037	.....	.....	
1,390	100,000	.00490	.00030	.....	.....	
1,459	105,000	.00538	.00048	.....	.....	Elastic limit.
1,529	110,000	.00584	.00046	.....	.....	
1,598	115,000	.00633	.00049	.....	.....	
1,668	120,000	.00695	.00062	.....	.....	
1,738	125,000	.00760	.00065	.....	.....	
1,807	130,000	.00837	.00077	.....	.....	
1,875	135,000	.00925	.00083	.....	.....	
1,946	140,000	.01038	.00113	.....	.....	
2,015	145,000	.014	.00362	.....	.....	
2,085	150,000	.017	.003	.....	.....	Tensile strength.
2,154	155,000	.021	.004	.....	.....	
2,182	156,980	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 156,980  
 Elastic limit per square inch of original section ..... do... 100,000  
 Elongation per inch after rupture..... inch... .020  
 Elongation per inch under strain at elastic limit..... do... .00490  
 Reduction in area after rupture, per centum of original section..... 48.9  
 Position of rupture..... ".55 inside the gauged length  
 Character of broken surface..... fine, silky

H. Ex. 165—29

No. 3820.

Sample 4.

Sectional area,  $".1173 \times ".1174 = .0137$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
68	5,000	0.	0.	0.	0.	
274	20,000	.00070	.00070	.....	.....	Elastic limit.
548	40,000	.00160	.00090	.....	.....	
822	60,000	.00243	.00083	.....	.....	
1,096	80,000	.00350	.00107	.....	.....	
1,164	85,000	.00378	.00028	.....	.....	
1,233	90,000	.00407	.00029	.....	.....	
1,301	95,000	.00445	.00038	.....	.....	
1,370	100,000	.00493	.00048	.....	.....	
1,438	105,000	.00540	.00047	.....	.....	
1,507	110,000	.00578	.00038	.....	.....	
1,575	115,000	.00631	.00053	.....	.....	
1,644	120,000	.00692	.00061	.....	.....	
1,712	125,000	.00764	.00072	.....	.....	
1,781	130,000	.00848	.00084	.....	.....	
1,849	135,000	.00940	.00092	.....	.....	
1,918	140,000	.01068	.00128	.....	.....	Tensile strength.
1,986	145,000	.012	.00132	.....	.....	
2,055	150,000	.017	.005	.....	.....	
2,123	155,000	.022	.005	.....	.....	
2,140	156,200	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 156,200  
 Elastic limit per square inch of original section.....do... 95,000  
 Elongation per inch after rupture.....inch... .020  
 Elongation per inch under strain at elastic limit.....do... .00445  
 Reduction in area after rupture, per centum of original section.....32.8  
 Position of rupture.....".80 inside the gauged length  
 Character of broken surface.....fine, silky



No. 3821.

Sample 4.

Sectional area,  $".1174 \times ".1178 = .0138$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
69	5,000	0.	0.	0.	0.	Initial load.
276	20,000	.00076	.00076	.....	.....	
552	40,000	.00161	.00085	.....	.....	
828	60,000	.00258	.00097	.....	.....	
1,104	80,000	.00361	.00103	.....	.....	
1,173	85,000	.00383	.00022	.....	.....	
1,242	90,000	.00418	.00035	.....	.....	
1,311	95,000	.00451	.00033	.....	.....	
1,380	100,000	.00489	.00038	.....	.....	
1,449	105,000	.00532	.00043	.....	.....	Elastic limit.
1,518	110,000	.00578	.00046	.....	.....	
1,587	115,000	.00628	.00050	.....	.....	
1,656	120,000	.00697	.00069	.....	.....	
1,725	125,000	.00753	.00056	.....	.....	
1,794	130,000	.00835	.00082	.....	.....	
1,863	135,000	.00924	.00089	.....	.....	
1,932	140,000	.01029	.00105	.....	.....	
2,001	145,000	.01157	.00128	.....	.....	
2,070	150,000	.015	.00343	.....	.....	Tensile strength.
2,139	155,000	.020	.005	.....	.....	
2,198	159,280	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds 159,280  
 Elastic limit per square inch of original section ..... do. 100,000  
 Elongation per inch after rupture ..... inch. .011  
 Elongation per inch under strain at elastic limit ..... do. .00489  
 Reduction in area after rupture, per centum of original section ..... 31.9  
 Position of rupture ..... 8".7 outside the gauged section  
 Character of broken surface ..... fine, silky

No. 3822.

Sample 6.

Sectional area,  $".1184 \times ".1185 = .014$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
70	5,000	0.	0.	0.	0.	
280	20,000	.00074	.00074	.....	.....	
560	40,000	.00160	.00086	.....	.....	
840	60,000	.00253	.00093	.....	.....	
1,120	80,000	.00353	.00105	.....	.....	
1,190	85,000	.00385	.00027	.....	.....	
1,260	90,000	.00421	.00036	.....	.....	
1,330	95,000	.00449	.00028	.....	.....	
1,400	100,000	.00487	.00038	.....	.....	
1,470	105,000	.00529	.00042	.....	.....	Elastic limit.
1,540	110,000	.00568	.00039	.....	.....	
1,610	115,000	.00621	.00053	.....	.....	
1,680	120,000	.00678	.00057	.....	.....	
1,750	125,000	.00743	.00065	.....	.....	
1,820	130,000	.00817	.00074	.....	.....	
1,890	135,000	.00908	.00091	.....	.....	
1,960	140,000	.01039	.00131	.....	.....	
2,030	145,000	.01195	.00156	.....	.....	
2,100	150,000	.017	.00305	.....	.....	Tensile strength.
2,170	155,000	.023	.006	.....	.....	
2,184	156,000	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section .....pounds.. 156,000  
 Elastic limit per square inch of original section .....do... 110,000  
 Elongation per inch after rupture .....inch.. .022  
 Elongation per inch under strain at elastic limit.....do... .00568  
 Reduction in area after rupture, per centum of original section .....42.1  
 Position of rupture.....".50 inside the gauged section  
 Character of broken surface .....fine, silky

No. 3823.

Sample 7.

Sectional area,  $".1161 \times ".1160 = ".0135$  square inch  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
67	5,000	0.	0.	0.	0.	Initial load.
270	20,000	.00079	.00079	.....	.....	
540	40,000	.00162	.00083	.....	.....	
810	60,000	.00257	.00095	.....	.....	
1,080	80,000	.00360	.00103	.....	.....	
1,147	85,000	.00382	.00022	.....	.....	
1,215	90,000	.00418	.00036	.....	.....	
1,282	95,000	.00444	.00026	.....	.....	
1,350	100,000	.00478	.00034	.....	.....	
1,417	105,000	.00517	.00039	.....	.....	
1,485	110,000	.00558	.00041	.....	.....	Elastic limit.
1,552	115,000	.00602	.00044	.....	.....	
1,620	120,000	.00652	.00050	.....	.....	
1,687	125,000	.00710	.00058	.....	.....	
1,755	130,000	.00779	.00069	.....	.....	
1,822	135,000	.00851	.00072	.....	.....	
1,890	140,000	.00964	.00118	.....	.....	
1,957	145,000	.01111	.00147	.....	.....	
2,025	150,000	.014	.00289	.....	.....	
2,092	155,000	.018	.004	.....	.....	
2,106	156,000	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 156,000  
 Elastic limit per square inch of original section.....do... 110,000  
 Elongation per inch after rupture.....inch......007  
 Elongation per inch under strain at elastic limit.....do... .00558  
 Reduction in area after rupture, per centum of original section.....43.7  
 Position of rupture.....".11 outside the gauged section  
 Character of broken surface.....fine, silky

No. 3824.

Sample 8.

Sectional area,  $".1193 \times ".1189 = .0142$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
71	5,000	0.	0.	0.	0.	
284	20,000	.00078	.00078	.....	.....	Elastic limit.
568	40,000	.00167	.00089	.....	.....	
852	60,000	.00262	.00095	.....	.....	
1,136	80,000	.00372	.00110	.....	.....	
1,207	85,000	.00401	.00029	.....	.....	
1,278	96,000	.00438	.00037	.....	.....	
1,349	95,000	.00478	.00040	.....	.....	
1,420	100,000	.00522	.00044	.....	.....	
1,491	105,000	.00565	.00043	.....	.....	
1,562	110,000	.00618	.00053	.....	.....	
1,633	115,000	.00686	.00068	.....	.....	
1,704	120,000	.00749	.00063	.....	.....	
1,775	125,000	.00821	.00072	.....	.....	
1,846	130,000	.00924	.00103	.....	.....	
1,917	135,000	.01054	.00130	.....	.....	
1,988	140,000	.01262	.00208	.....	.....	Tensile strength.
2,069	145,000	.018	.00538	.....	.....	
2,118	149,150	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds. 149,150  
 Elastic limit per square inch of original section.....do... 105,000  
 Elongation per inch after rupture.....inch... .013  
 Elongation per inch under strain at elastic limit.....do... .00565  
 Reduction in area after rupture, per centum of original section..... 47.9  
 Position of rupture.....".45 outside the gauged section  
 Character of broken surface.....fine, silky

No. 3825.

Sample 9.

Sectional area,  $".1179 \times ".1178 = .0139$  square inch.

Gauged length, ".10

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
89	5,000	0.	0.	0.	0.	Initial load.
278	20,000	.00071	.00071	.....	.....	
556	40,000	.00162	.00091	.....	.....	
834	60,000	.00250	.00088	.....	.....	
1,112	80,000	.00351	.00101	.....	.....	
1,181	85,000	.00374	.00023	.....	.....	
1,251	90,000	.00403	.00029	.....	.....	
1,320	95,000	.00435	.00032	.....	.....	
1,390	100,000	.00468	.00033	.....	.....	
1,459	105,000	.00502	.00034	.....	.....	
1,529	110,000	.00548	.00046	.....	.....	Elastic limit.
1,598	115,000	.00578	.00030	.....	.....	
1,668	120,000	.00628	.00050	.....	.....	
1,737	125,000	.00680	.00052	.....	.....	
1,807	130,000	.00738	.00058	.....	.....	
1,876	135,000	.00808	.00070	.....	.....	
1,946	140,000	.00899	.00091	.....	.....	
2,015	145,000	.01028	.00129	.....	.....	
2,085	150,000	.01310	.00282	.....	.....	
2,147	154,460	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 154,4  
 Elastic limit per square inch of original section ..... do... 115,0  
 Elongation per inch after rupture ..... inch... 0  
 Elongation per inch under strain at elastic limit ..... do... .005  
 Reduction in area after rupture, per centum of original section ..... 36  
 Position of rupture ..... "1.85 inside the gauged section  
 Character of broken surface ..... fine, silk

No. 3826.

Sample 10.

Sectional area,  $''\text{.1165} \times ''\text{.1169} = .0136$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
68	5,000	0.	0.	0.	0.	Initial load.
272	20,000	.00075	.00075	.....	.....	
544	40,000	.00161	.00086	.....	.....	
816	60,000	.00265	.00104	.....	.....	
1,088	80,000	.00357	.00092	.....	.....	
1,156	85,000	.00372	.00015	.....	.....	
1,224	90,000	.00400	.00028	.....	.....	
1,292	95,000	.00426	.00026	.....	.....	
1,360	100,000	.00458	.00032	.....	.....	
1,428	105,000	.00496	.00038	.....	.....	
1,496	110,000	.00520	.00024	.....	.....	Elastic limit.
1,564	115,000	.00565	.00045	.....	.....	
1,632	120,000	.00605	.00040	.....	.....	
1,700	125,000	.00652	.00047	.....	.....	
1,768	130,000	.00705	.00053	.....	.....	
1,836	135,000	.00764	.00059	.....	.....	
1,904	140,000	.00830	.00066	.....	.....	
1,972	145,000	.00910	.00080	.....	.....	
2,040	150,000	.01012	.00102	.....	.....	
2,108	155,000	.012	.00188	.....	.....	
2,176	160,000	.014	.002	.....	.....	Tensile strength.
2,244	165,000	.020	.006	.....	.....	

## General summary.

Tensile strength, per square inch of original section ..... pounds.. 165,000  
 Elastic limit, per square inch of original section..... do... 115,000  
 Elongation per inch after rupture ..... inch... .010  
 Elongation per inch under strain at elastic limit..... do... .00565  
 Reduction in area after rupture, per centum of original section ..... 45.6  
 Position of rupture..... 2'' outside the gauged section  
 Character of broken surface ..... fine, silky

## SAMPLES FROM ENDS OF COILS AFTER THIRD DRAWING, SECOND HOLE.

No. 3827.

Sample 1.

Sectional area,  $''0996 \times ''0995 = .0099$  square inch.  
 Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00075	.00075	.....	.....	
396	40,000	.00158	.00083	.....	.....	
594	60,000	.00244	.00086	.....	.....	
792	80,000	.00343	.00099	.....	.....	
990	100,000	.00457	.00114	.....	.....	
1,039	105,000	.00482	.00025	.....	.....	
1,089	110,000	.00515	.00033	.....	.....	
1,138	115,000	.00553	.00038	.....	.....	
1,188	120,000	.00583	.00030	.....	.....	Elastic limit.
1,237	125,000	.00633	.00050	.....	.....	
1,287	130,000	.00682	.00049	.....	.....	
1,336	135,000	.00743	.00061	.....	.....	
1,386	140,000	.00807	.00064	.....	.....	
1,435	145,000	.00888	.00081	.....	.....	
1,485	150,000	.00999	.00111	.....	.....	
1,534	155,000	.01166	.00187	.....	.....	
1,584	160,000	.016	.00434	.....	.....	
1,633	165,000	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 165,000  
 Elastic limit per square inch of original section.....do... 120,000  
 Elongation per inch after rupture.....inch... .007  
 Elongation per inch under strain at elastic limit.....do... .00583  
 Reduction in area after rupture, per centum of original section..... 38.4  
 Position of rupture.....8''.75 outside the gauged section  
 Character of broken surface.....fine, silky

No. 3828.

Sample 2.

Sectional area,  $".0992 \times ".0995 = .0099$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
49	5,000	0.	0.	0.	0.	
198	20,000	.00073	.00073	.....	.....	
396	40,000	.00160	.00087	.....	.....	
594	60,000	.00251	.00091	.....	.....	
792	80,000	.00351	.00100	.....	.....	
990	100,000	.00470	.00119	.....	.....	
1,039	105,000	.00491	.00021	.....	.....	
1,089	110,000	.00536	.00045	.....	.....	
1,138	115,000	.00578	.00042	.....	.....	
1,188	120,000	.00607	.00029	.....	.....	Elastic limit.
1,237	125,000	.00657	.00050	.....	.....	
1,287	130,000	.00720	.00063	.....	.....	
1,336	135,000	.00775	.00055	.....	.....	
1,386	140,000	.00848	.00073	.....	.....	
1,435	145,000	.00940	.00092	.....	.....	
1,485	150,000	.01073	.00133	.....	.....	
1,534	155,000	.01295	.00222	.....	.....	
1,584	160,000	.016	.00305	.....	.....	
						Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 160,000  
 Elastic limit per square inch of original section ..... do... 120,000  
 Elongation per inch after rupture ..... inch... .003  
 Elongation per inch under strain at elastic limit ..... do... .00607  
 Reduction in area after rupture, per centum of original section ..... 38.4  
 Position of rupture ..... 9" outside the gauged section  
 Character of broken surface ..... fine, silky



No. 3829.

Sample 3.

Sectional area,  $".1005 \times ".1012 = .01$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per-square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00078	.00078			
400	40,000	.00168	.00090			
600	60,000	.00261	.00093			
800	80,000	.00352	.00091			
1,000	100,000	.00458	.00106			
1,050	105,000	.00484	.00026			
1,100	110,000	.00517	.00033			
1,150	115,000	.00552	.00035			
1,200	120,000	.00590	.00038			
1,250	125,000	.00627	.00037			Elastic limit.
1,300	130,000	.00668	.00041			
1,350	135,000	.00717	.00049			
1,400	140,000	.00778	.00061			
1,450	145,000	.00850	.00072			
1,500	150,000	.00937	.00087			
1,550	155,000	.01057	.00120			
1,600	160,000	.01245	.00188			
1,650	165,000	.015	.00255			
1,700	170,000	.020	.005			
1,718	171,800					Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 171,800  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch... .014  
 Elongation per inch under strain at elastic limit.....do... .00668  
 Reduction in area after rupture, per centum of original section.....45.0  
 Position of rupture.....".4 outside the gauged section  
 Character of broken surface.....fine, silky

*Sample 4.*

Sectional area,  $''\text{.0999} \times ''\text{.0998} = .0099$  square inch.  
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
199	20,000	.00077	.00077	.....	.....	
399	40,000	.00160	.00083	.....	.....	
594	60,000	.00250	.00090	.....	.....	
792	80,000	.00344	.00094	.....	.....	
990	100,000	.00438	.00114	.....	.....	
1,039	105,000	.00480	.00022	.....	.....	
1,089	110,000	.00512	.00032	.....	.....	
1,138	115,000	.00545	.00033	.....	.....	
1,188	120,000	.00586	.00041	.....	.....	
1,237	125,000	.00636	.00050	.....	.....	Elastic limit.
1,287	130,000	.00683	.00047	.....	.....	
1,336	135,000	.00725	.00042	.....	.....	
1,386	140,000	.00791	.00066	.....	.....	
1,435	145,000	.00868	.00077	.....	.....	
1,485	150,000	.00963	.00095	.....	.....	
1,534	155,000	.011	.00137	.....	.....	
1,584	160,000	.013	.002	.....	.....	
1,633	165,000	.017	.004	.....	.....	
1,683	170,000	.....	.....	.....	.....	Ultimate strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	170, 000
Elastic limit per square inch of original section.....	do.	120, 000
Elongation per inch after rupture.....	inch.	.018
Elongation per inch under strain at elastic limit.....	do.	.00586
Reduction in area after rupture, per centum of original section.....		38.4
Position of rupture.....	" .90 outside the gauged section	
Character of broken surface.....		fine, silky

No. 3831.

Sample 5.

Sectional area,  $".1005 \times ".1005 = .01$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00082	.00082	.....	.....	
400	40,000	.00187	.00085	.....	.....	
600	60,000	.00256	.00089	.....	.....	
800	80,000	.00357	.00101	.....	.....	
1,000	100,000	.00468	.00111	.....	.....	
1,050	105,000	.00492	.00024	.....	.....	
1,100	110,000	.00528	.00036	.....	.....	
1,150	115,000	.00567	.00039	.....	.....	
1,200	120,000	.00608	.00041	.....	.....	Elastic limit.
1,250	125,000	.00644	.00036	.....	.....	
1,300	130,000	.00697	.00033	.....	.....	
1,350	135,000	.00748	.00051	.....	.....	
1,400	140,000	.00817	.00069	.....	.....	
1,450	145,000	.00905	.00088	.....	.....	
1,500	150,000	.01030	.00125	.....	.....	
1,550	155,000	.01120	.00090	.....	.....	
1,600	160,000	.01340	.00220	.....	.....	
1,650	165,000	.017	.00360	.....	.....	Tensile strength.
1,700	170,000	.025	.008	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 170,000  
 Elastic limit per square inch of original section ..... do... 125,000  
 Elongation per inch after rupture ..... inch... .019  
 Elongation per inch under strain at elastic limit ..... do... .00644  
 Reduction in area after rupture, per centum of original section ..... 33.0  
 Position of rupture ..... 3".4 inside the gauged section  
 Character of broken surface ..... fine, silky

No. 3832.

*Sample 6.*

Sectional area,  $''0.0997 \times ''0.0998 = ''0.0099$  square inch.  
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00076	.00076	.....	.....	
396	40,000	.00162	.00086	.....	.....	
594	60,000	.00248	.00086	.....	.....	
792	80,000	.00348	.00100	.....	.....	
990	100,000	.00467	.00119	.....	.....	
1,039	105,000	.00485	.00018	.....	.....	
1,089	110,000	.00523	.00038	.....	.....	
1,138	115,000	.00555	.00042	.....	.....	
1,188	120,000	.00597	.00032	.....	.....	Elastic limit.
1,237	125,000	.00642	.00045	.....	.....	
1,287	130,000	.00695	.00053	.....	.....	
1,336	135,000	.00750	.00055	.....	.....	
1,386	140,000	.00840	.00090	.....	.....	
1,435	145,000	.00940	.00100	.....	.....	
1,485	150,000	.01080	.00140	.....	.....	
1,534	155,000	.01260	.00180	.....	.....	
1,584	160,000	.014	.00140	.....	.....	
1,633	165,000	.020	.006	.....	.....	Tensile strength.
1,662	167,880	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 167,880  
 Elastic limit per square inch of original section ..... do... .012  
 Elongation per inch after rupture..... inch... 120,000  
 Elongation per inch under strain at elastic limit..... do... .00597  
 Reduction in area after rupture, per centum of original section..... 46.5  
 Position of rupture..... 1".45 outside the gauged section  
 Character of broken surface..... fine, silky

No. 3833.

Sample 7.

Sectional area,  $".1002 \times ".1014 = .0101$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
202	20,000	.00088	.00088	.....	.....	
404	40,000	.00172	.00084	.....	.....	
606	60,000	.00277	.00105	.....	.....	
808	80,000	.00366	.00089	.....	.....	
1,010	100,000	.00487	.00121	.....	.....	Elastic limit.
1,060	105,000	.00512	.00025	.....	.....	
1,111	110,000	.00552	.00040	.....	.....	
1,161	115,000	.00590	.00038	.....	.....	
1,212	120,000	.00633	.00043	.....	.....	
1,262	125,000	.00685	.00052	.....	.....	
1,313	130,000	.00738	.00053	.....	.....	
1,363	135,000	.00800	.00062	.....	.....	
1,414	140,000	.00880	.00080	.....	.....	
1,464	145,000	.00970	.00090	.....	.....	
1,515	150,000	.01097	.00127	.....	.....	Tensile strength.
1,565	155,000	.01285	.00188	.....	.....	
1,616	160,000	.017	.00415	.....	.....	
1,666	165,000	.021	.004	.....	.....	
1,684	160,730	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 166,730  
 Elastic limit per square inch of original section ..... do... 120,000  
 Elongation per inch after rupture ..... inch... .022  
 Elongation per inch under strain at elastic limit ..... do... .00633  
 Reduction in area after rupture, per centum of original section ..... 44.5  
 Position of rupture ..... 1/30 inside the gauged length  
 Character of broken surface ..... fine, silky

No. 3834.

Sample 8.

Sectional area,  $".0994 \times ".0994 = ".0099$  square inch.

Gauged length, 10'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00080	.00080	.....	.....	
396	40,000	.00160	.00080	.....	.....	
594	60,000	.00258	.00098	.....	.....	
792	80,000	.00358	.00100	.....	.....	
990	100,000	.00458	.00100	.....	.....	
1,039	105,000	.00478	.00020	.....	.....	
1,089	110,000	.00510	.00032	.....	.....	
1,138	115,000	.00542	.00032	.....	.....	
1,188	120,000	.00580	.00038	.....	.....	
1,237	125,000	.00620	.00040	.....	.....	
1,287	130,000	.00662	.00042	.....	.....	Elastic limit.
1,336	135,000	.00720	.00058	.....	.....	
1,386	140,000	.00777	.00057	.....	.....	
1,435	145,000	.00851	.00074	.....	.....	
1,485	150,000	.00942	.00091	.....	.....	
1,534	155,000	.01085	.00143	.....	.....	
1,584	160,000	.01285	.00200	.....	.....	
1,633	165,000	.017	.00415	.....	.....	
1,670	168,690	.020	.003	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 168,690  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch... .008  
 Elongation per inch under strain at elastic limit.....do... .00662  
 Reduction in area after rupture, per centum of original section.....40.4  
 Position of rupture.....".60 outside the gauged section  
 Character of broken surface.....fine, silky

No. 3835.

Sample 9.

Sectional area,  $''\cdot0993 \times ''\cdot0994 = .0099$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00081	.00081	.....	.....	
396	40,000	.00169	.00088	.....	.....	
594	60,000	.00259	.00090	.....	.....	
792	80,000	.00360	.00101	.....	.....	
990	100,000	.00475	.00115	.....	.....	
1,039	105,000	.00502	.00027	.....	.....	
1,089	110,000	.00543	.00041	.....	.....	
1,138	115,000	.00582	.00039	.....	.....	
1,188	120,000	.00620	.00038	.....	.....	Elastic limit.
1,237	125,000	.00673	.00053	.....	.....	
1,287	130,000	.00723	.00050	.....	.....	
1,336	135,000	.00784	.00061	.....	.....	
1,386	140,000	.00856	.00072	.....	.....	
1,435	145,000	.00939	.00083	.....	.....	
1,485	150,000	.01052	.00113	.....	.....	
1,534	155,000	.01220	.00168	.....	.....	
1,584	160,000	.015	.0028	.....	.....	
1,633	165,000	.019	.003	.....	.....	Tensile strength.
1,666	168,280	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 168,280  
 Elastic limit per square inch of original section ..... do... 120,000  
 Elongation per inch after rupture ..... inch... .014  
 Elongation per inch under strain at elastic limit ..... do... .00620  
 Reduction in area after rupture, per centum of original section ..... 30.3  
 Position of rupture ..... 3", 35 outside the gauged section  
 Character of broken surface ..... fine, silky

H. Ex. 165—30

No. 3836.

Sample 10.

Sectional area,  $".1004 \times ".1006 = .010$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i> 50	<i>Pounds.</i> 5,000	<i>Inch.</i> 0.	<i>Inch.</i> 0.	<i>Inch.</i> 0.	<i>Inch.</i> 0.	Initial load.
200	20,000	.00086	.00086	.....	.....	
400	40,000	.00167	.00081	.....	.....	
600	60,000	.00253	.00086	.....	.....	
800	80,000	.00343	.00090	.....	.....	
1,000	100,000	.00446	.00103	.....	.....	
1,050	105,000	.00473	.00027	.....	.....	
1,100	110,000	.00506	.00033	.....	.....	
1,150	115,000	.00537	.00031	.....	.....	
1,200	120,000	.00575	.00038	.....	.....	
1,250	125,000	.00610	.00035	.....	.....	Elastic limit.
1,300	130,000	.00653	.00043	.....	.....	
1,350	135,000	.00703	.00050	.....	.....	
1,400	140,000	.00760	.00057	.....	.....	
1,450	145,000	.00805	.00045	.....	.....	
1,500	150,000	.00870	.00065	.....	.....	
1,550	155,000	.00955	.00085	.....	.....	
1,600	160,000	.01040	.00085	.....	.....	
1,650	165,000	.01160	.00120	.....	.....	
1,700	170,000	.014	.00240	.....	.....	
1,750	175,000	.017	.003	.....	.....	Tensile strength.
1,800	180,000	.024	.007	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 180,000  
 Elastic limit per square inch of original section ..... do... 125,000  
 Elongation per inch after rupture ..... inch... .019  
 Elongation per inch under strain at elastic limit ..... do... .00610  
 Reduction in area after rupture, per centum of original section ..... 36.0  
 Position of rupture ..... 1" .20 inside the gauged section  
 Character of broken surface ..... fine, silky



## FINISHED WIRE ".1 SQUARE TINNED.

No. 3798.

Sample 1.

Sectional area,  $".0986 \times ".099 = .0097$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
48	5,000	0.	0.	0.	0.	
194	20,000	.00075	.00075	.....	.....	
388	40,000	.00150	.00075	.....	.....	
582	60,000	.00220	.00070	.....	.....	
776	80,000	.00298	.00078	.....	.....	
824	85,000	.00314	.00016	.....	.....	
873	90,000	.00332	.00018	.....	.....	
921	95,000	.00355	.00023	.....	.....	
970	100,000	.00375	.00020	.....	.....	
1,018	105,000	.00393	.00018	.....	.....	
1,067	110,000	.00418	.00025	.....	.....	
1,115	115,000	.00438	.00020	.....	.....	
1,164	120,000	.00463	.00025	.....	.....	
1,212	125,000	.00488	.00025	.....	.....	
1,261	130,000	.00513	.00025	.....	.....	
1,309	135,000	.00540	.00027	.....	.....	
1,358	140,000	.00568	.00028	.....	.....	Elastic limit.
1,406	145,000	.00603	.00035	.....	.....	
1,455	150,000	.00642	.00039	.....	.....	
1,503	155,000	.00698	.00056	.....	.....	
1,552	160,000	.00760	.00062	.....	.....	
1,600	165,000	.00872	.00112	.....	.....	
1,649	170,000	.01088	.00216	.....	.....	
1,697	175,000	.018	.00712	.....	.....	
1,738	179,180	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 179,180  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch.. .023  
 Elongation per inch under strain at elastic limit ..... do... .00642  
 Reduction in area after rupture, per centum of original section ..... 37.1  
 Position of rupture ..... 2".25 inside the gauged section  
 Character of broken surface ..... fine, silky

No. 3799.

Sample 2.

Sectional area,  $".0990 \times ".0993 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00065	.00065	.....	.....	
392	40,000	.00138	.00073	.....	.....	
588	60,000	.00220	.00082	.....	.....	
784	80,000	.00298	.00078	.....	.....	
980	100,000	.00374	.00076	.....	.....	
1,029	105,000	.00388	.00014	.....	.....	
1,078	110,000	.00411	.00023	.....	.....	
1,127	115,000	.00436	.00027	.....	.....	
1,176	120,000	.00460	.00024	.....	.....	
1,225	125,000	.00482	.00022	.....	.....	
1,274	130,000	.00511	.00029	.....	.....	
1,323	135,000	.00539	.00028	.....	.....	
1,372	140,000	.00570	.00031	.....	.....	
1,421	145,000	.00604	.00034	.....	.....	Elastic limit.
1,470	150,000	.00648	.00044	.....	.....	
1,519	155,000	.00714	.00066	.....	.....	
1,568	160,000	.00797	.00083	.....	.....	
1,617	165,000	.01037	.00240	.....	.....	
1,666	170,000	.020	.00963	.....	.....	Tensile strength.
1,708	174,290	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,290  
 Elastic limit per square inch of original section ..... do. .. 145,000  
 Elongation per inch after rupture ..... inch.. .015  
 Elongation per inch under strain at elastic limit ..... do. .. .00604  
 Reduction in area after rupture, per centum of original section ..... 34.7  
 Position of rupture ..... 5". 2 outside the gauged section  
 Character of broken surface ..... fine, silky

No. 3800.

Sample 3.

Sectional area,  $".0988 \times ".0994 = .0098$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00064	.00064	.....	.....	
392	40,000	.00138	.00074	.....	.....	
588	60,000	.00216	.00073	.....	.....	
784	80,000	.00296	.00080	.....	.....	
980	100,000	.00377	.00081	.....	.....	
1,029	105,000	.00392	.00015	.....	.....	
1,078	110,000	.00414	.00022	.....	.....	
1,127	115,000	.00434	.00020	.....	.....	
1,176	120,000	.00461	.00027	.....	.....	
1,225	125,000	.00486	.00025	.....	.....	
1,274	130,000	.00505	.00019	.....	.....	
1,323	135,000	.00526	.00021	.....	.....	
1,372	140,000	.00551	.00025	.....	.....	
1,421	145,000	.00584	.00033	.....	.....	
1,470	150,000	.00611	.00027	.....	.....	Elastic limit.
1,519	155,000	.00657	.00046	.....	.....	
1,568	160,000	.00702	.00045	.....	.....	
1,617	165,000	.00776	.00074	.....	.....	
1,666	170,000	.00890	.00114	.....	.....	
1,715	175,000	.01270	.00380	.....	.....	Tensile strength.
1,764	180,000	.021	.00830	.....	.....	
1,800	183,670	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 183,670  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... 0.30  
 Elongation per inch under strain at elastic limit ..... do... .00611  
 Reduction in area after rupture, per centum of original section ..... 36.7  
 Position of rupture ..... 3".75 inside the gauged section  
 Character of broken surface ..... fine, silky

No. 3801.

Sample 4.

Sectional area,  $".0987 \times ".0992 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0	Initial load.
196	20,000	.00077	.00077	.....	.....	
392	40,000	.00152	.00075	.....	.....	
588	60,000	.00235	.00083	.....	.....	
784	80,000	.00304	.00069	.....	.....	
980	100,000	.00395	.00091	.....	.....	
1,029	105,000	.00408	.00013	.....	.....	
1,078	110,000	.00437	.00029	.....	.....	
1,127	115,000	.00455	.00018	.....	.....	
1,176	120,000	.00478	.00023	.....	.....	
1,225	125,000	.00506	.00028	.....	.....	
1,274	130,000	.00531	.00025	.....	.....	
1,323	135,000	.00553	.00022	.....	.....	
1,372	140,000	.00588	.00035	.....	.....	
1,421	145,000	.00618	.00030	.....	.....	Elastic limit.
1,470	150,000	.00653	.00035	.....	.....	
1,519	155,000	.00700	.00047	.....	.....	
1,568	160,000	.00768	.00068	.....	.....	
1,617	165,000	.00885	.00117	.....	.....	
1,666	170,000	.01142	.00257	.....	.....	Tensile strength.
1,715	175,000	.018	.00658	.....	.....	
1,764	180,000	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 180,000  
 Elastic limit per square inch of original section.....do... 150,000  
 Elongation per inch after rupture.....inch... .015  
 Elongation per inch under strain at elastic limit.....do... .00653  
 Reduction in area after rupture, per centum of original section..... 37.8  
 Position of rupture.....".80 outside the gauged section  
 Character of broken surface .....fine, silky

No. 3802.

Sample 5.

Sectional area,  $".1002 \times ".1003 = .010$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00070	.00070	.....	.....	
400	40,000	.00150	.00080	.....	.....	
600	60,000	.00228	.00078	.....	.....	
800	80,000	.00308	.00080	.....	.....	
1,000	100,000	.00390	.00082	.....	.....	
1,050	105,000	.00408	.00018	.....	.....	
1,100	110,000	.00430	.00022	.....	.....	
1,150	115,000	.00451	.00021	.....	.....	
1,200	120,000	.00480	.00029	.....	.....	
1,250	125,000	.00500	.00020	.....	.....	
1,300	130,000	.00528	.00028	.....	.....	
1,350	135,000	.00558	.00030	.....	.....	
1,400	140,000	.00583	.00025	.....	.....	
1,450	145,000	.00618	.00035	.....	.....	Elastic limit.
1,500	150,000	.00660	.00042	.....	.....	
1,550	155,000	.00711	.00051	.....	.....	
1,600	160,000	.00785	.00074	.....	.....	
1,650	165,000	.00911	.00126	.....	.....	
1,700	170,000	.01158	.00247	.....	.....	
1,750	175,000	.018	.00642	.....	.....	
1,800	180,000	.027	.009	.....	.....	Tensile strength.
1,802	180,200	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 180,200  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .025  
 Elongation per inch under strain at elastic limit.....do... .00618  
 Reduction in area after rupture, per centum of original section..... 33.0  
 Position of rupture.....".80 inside the gauged section  
 Character of broken surface.....fine, silky

No. 3803.

Sample 6.

Sectional area,  $".0994 \times ".0100 = .0099$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
40	5,000	0.	0.	0.	0.	
198	20,000	.00074	.00074	.....	.....	
396	40,000	.00151	.00077	.....	.....	
594	60,000	.00231	.00080	.....	.....	
792	80,000	.00313	.00082	.....	.....	
990	100,000	.00416	.00103	.....	.....	
1,039	105,000	.00426	.00010	.....	.....	
1,089	110,000	.00446	.00020	.....	.....	
1,138	115,000	.00480	.00034	.....	.....	
1,188	120,000	.00505	.00025	.....	.....	
1,237	125,000	.00541	.00036	.....	.....	
1,287	130,000	.00573	.00032	.....	.....	
1,336	135,000	.00608	.00035	.....	.....	Elastic limit.
1,386	140,000	.00650	.00042	.....	.....	
1,435	145,000	.00693	.00043	.....	.....	
1,485	150,000	.00750	.00057	.....	.....	
1,534	155,000	.00830	.00080	.....	.....	
1,584	160,000	.00906	.00076	.....	.....	Tensile strength.
1,633	165,000	.01056	.00150	.....	.....	
1,683	170,000	.01500	.00444	.....	.....	
1,732	175,000	.02200	.007	.....	.....	
1,782	177,980	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 177,980  
 Elastic limit per square inch of original section.....do.. 135,000  
 Elongation per inch after rupture .....inch.. .024  
 Elongation per inch under strain at elastic limit .....do.. .00608  
 Reduction in area after rupture, per centum of original section..... 32.3  
 Position of rupture .....1".65 inside the gauged section  
 Character of broken surface.....fine, silky

No. 3804.

Sample 8.

Sectional area,  $".0993 \times ".0994 = .0099$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,600	0.	0.	0.	0.	Initial load.
198	20,000	.00078	.00078			
396	40,000	.00155	.00078			
594	60,000	.00228	.00072			
792	80,000	.00310	.00082			
990	100,000	.00388	.00078			
1,039	105,000	.00406	.00018			
1,089	110,000	.00424	.00018			
1,138	115,000	.00448	.00024			
1,188	120,000	.00467	.00019			
1,237	125,000	.00490	.00023			
1,287	130,000	.00512	.00022			
1,336	135,000	.00539	.00027			
1,386	140,000	.00570	.00031			
1,435	145,000	.00597	.00027			Elastic limit.
1,485	150,000	.00637	.00040			
1,534	155,000	.00689	.00052			
1,584	160,000	.00781	.00092			
1,633	165,000	.01223	.00442			
1,683	170,000	.022	.00977			
1,730	174,750					Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 174,750  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .021  
 Elongation per inch under strain at elastic limit ..... do... .00597  
 Reduction in area after rupture, per centum of original section ..... 43.1  
 Position of rupture ..... 5".95 outside the gauged section  
 Character of broken surface ..... fine, silky

No. 3805.

Sample 9.

Sectional area,  $''0.0996 \times ''0.0995 = .0099$  square inch.  
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
49	5,000	0.	0.	0.	0.	
198	20,000	.00072	.00072	.....	.....	
396	40,000	.00149	.00077	.....	.....	
594	60,000	.00224	.00075	.....	.....	
792	80,000	.00308	.00084	.....	.....	
890	100,000	.00395	.00087	.....	.....	
1,039	105,000	.00413	.00018	.....	.....	
1,089	110,000	.00436	.00023	.....	.....	
1,138	115,000	.00467	.00031	.....	.....	
1,188	120,000	.00487	.00020	.....	.....	
1,237	125,000	.00514	.00027	.....	.....	
1,287	130,000	.00544	.00030	.....	.....	
1,336	135,000	.00571	.00027	.....	.....	
1,386	140,000	.00602	.00031	.....	.....	Elastic limit.
1,435	145,000	.00642	.00040	.....	.....	
1,485	150,000	.00686	.00044	.....	.....	
1,534	155,000	.00738	.00052	.....	.....	
1,584	160,000	.00818	.00080	.....	.....	
1,633	165,000	.00933	.00115	.....	.....	Tensile strength.
1,683	170,000	.012	.00267	.....	.....	
1,732	175,000	.017	.005	.....	.....	
1,780	179,800	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 179,800  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .012  
 Elongation per inch under strain at elastic limit ..... do... .00602  
 Reduction in area after rupture, per centum of original section ..... 25.3  
 Position of rupture ..... 3."95 outside the gauged section  
 Character of broken surface ..... fine, silky



No. 3806.

Sample 10.

Sectional area,  $".1002 \times ".1004 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00073	.00073	.....	.....	
300	30,000	.00150	.00077	.....	.....	
400	40,000	.00226	.00076	.....	.....	
500	50,000	.00305	.00079	.....	.....	
600	60,000	.00383	.00078	.....	.....	
700	70,000	.00403	.00020	.....	.....	
800	80,000	.00427	.00024	.....	.....	
900	90,000	.00447	.00020	.....	.....	
1,000	100,000	.00473	.00026	.....	.....	
1,100	110,000	.00498	.00025	.....	.....	
1,200	120,000	.00524	.00026	.....	.....	
1,300	130,000	.00553	.00029	.....	.....	
1,400	140,000	.00577	.00024	.....	.....	
1,500	150,000	.00609	.00032	.....	.....	
1,600	160,000	.00647	.00038	.....	.....	Elastic limit.
1,700	170,000	.00677	.00030	.....	.....	
1,800	180,000	.00725	.00048	.....	.....	
1,900	190,000	.00776	.00051	.....	.....	
1,908	190,800	.00845	.00069	.....	.....	
		.00912	.00067	.....	.....	
		.011	.00188	.....	.....	
		.013	.002	.....	.....	
		.017	.004	.....	.....	
		.....	.....	.....	.....	
		.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 190,800  
 Elastic limit per square inch of original section ..... do... 155,000  
 Elongation per inch after rupture ..... inch... .012  
 Elongation per inch under strain at elastic limit ..... do... .00670  
 Reduction in area after rupture, per centum of original section ..... 39.7  
 Position of rupture ..... ".75 inside the gauged section  
 Character of broken surface ..... fine, silky

## .1-INCH SQUARE TINNED STEEL WIRE.

No. 3997.

Mark, No. 15.

Sectional area,  $".1002 \times ".1001 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00070	.00070	.....	.....	
400	40,000	.00143	.00073	.....	.....	
600	60,000	.00236	.00093	.....	.....	
800	80,000	.00300	.00064	.....	.....	
1,000	100,000	.00393	.00093	.....	.....	
1,200	120,000	.00491	.00098	.....	.....	
1,250	125,000	.00510	.00019	.....	.....	
1,300	130,000	.00537	.00027	.....	.....	
1,350	135,000	.00567	.00030	.....	.....	
1,400	140,000	.00605	.00038	.....	.....	Elastic limit.
1,450	145,000	.00638	.00033	.....	.....	
1,500	150,000	.00685	.00047	.....	.....	
1,550	155,000	.00735	.00050	.....	.....	
1,600	160,000	.00804	.00069	.....	.....	
1,650	165,000	.00890	.00086	.....	.....	
1,700	170,000	.01061	.00171	.....	.....	
1,750	175,000	.016	.00539	.....	.....	
1,800	180,000	.030	.014	.....	.....	
						Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 180,000  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .024  
 Elongation per inch under strain at elastic limit.....do... .00638  
 Reduction in area after rupture, per centum of original section.....42.0  
 Position of rupture.....at end of gauged section  
 Character of broken surface.....fine, silky

No. 3998.

Mark, No. 20.

Sectional area,  $'' .0994 \times '' .0995 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
40	5,000	0.	0.	0.	0.	Initial load.
108	20,000	.00069	.00069	.....	.....	
306	40,000	.00142	.00073	.....	.....	
504	60,000	.00221	.00079	.....	.....	
702	80,000	.00297	.00076	.....	.....	
900	100,000	.00381	.00084	.....	.....	
1,188	120,000	.00467	.00086	.....	.....	
1,237	125,000	.00482	.00015	.....	.....	
1,287	130,000	.00503	.00021	.....	.....	
1,336	135,000	.00530	.00027	.....	.....	
1,386	140,000	.00555	.00025	.....	.....	
1,436	145,000	.00581	.00026	.....	.....	
1,485	150,000	.00610	.00029	.....	.....	
1,535	155,000	.00647	.00037	.....	.....	
1,584	160,000	.00678	.00031	.....	.....	Elastic limit.
1,634	165,000	.00731	.00053	.....	.....	
1,683	170,000	.00790	.00059	.....	.....	
1,733	175,000	.00832	.00142	.....	.....	
1,782	180,000	.01160	.00228	.....	.....	Tensile strength.
1,832	185,000	.022	.0104	.....	.....	
1,868	188,690	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 188,690  
 Elastic limit per square inch of original section ..... do... 160,000  
 Elongation per inch after rupture ..... inch.. .027  
 Elongation per inch under strain at elastic limit ..... do... .00678  
 Reduction in area after rupture, per centum of original section ..... 43.4  
 Position of rupture ..... 2'' .8 inside the gauged section  
 Character of broken surface ..... fine, silky

No. 3999.

Mark, No. 25.

Sectional area,  $''\cdot0992 \times ''\cdot0996 = ''\cdot0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
49	5,000	0.	0.	0.	0.	
198	20,000	.00076	.00076	.....	.....	
396	40,000	.00150	.00074	.....	.....	
594	60,000	.00234	.00084	.....	.....	
792	80,000	.00319	.00085	.....	.....	Elastic limit.
990	100,000	.00414	.00095	.....	.....	
1,188	120,000	.00524	.00110	.....	.....	
1,237	125,000	.00554	.00030	.....	.....	
1,287	130,000	.00586	.00032	.....	.....	
1,336	135,000	.00629	.00043	.....	.....	
1,386	140,000	.00679	.00050	.....	.....	
1,436	145,000	.00739	.00060	.....	.....	
1,485	150,000	.00811	.00072	.....	.....	
1,535	155,000	.00912	.00101	.....	.....	
1,584	160,000	.01100	.00188	.....	.....	Tensile strength.
1,634	165,000	.016	.005	.....	.....	
1,678	169,490	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 169,490  
 Elastic limit per square inch of original section ..... do... 130,000  
 Elongation per inch after rupture ..... inch.. .010  
 Elongation per inch under strain at elastic limit ..... do... .00586  
 Reduction in area after rupture, per centum of original section ..... 41.4  
 Position of rupture ..... 3''·45 outside the gauged section  
 Character of broken surface ..... fine, silky

No. 4000.

Mark, No. 30.

Sectional area,  $".0992 \times ".0993 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
40	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00074	.00074	.....	.....	
392	40,000	.00156	.00082	.....	.....	
588	60,000	.00234	.00078	.....	.....	
784	80,000	.00317	.00083	.....	.....	
980	100,000	.00421	.00104	.....	.....	Elastic limit.
1,176	120,000	.00544	.00123	.....	.....	
1,225	125,000	.00576	.00032	.....	.....	
1,274	130,000	.00623	.00047	.....	.....	
1,323	135,000	.00678	.00055	.....	.....	
1,372	140,000	.00743	.00065	.....	.....	
1,421	145,000	.00848	.00105	.....	.....	
1,470	150,000	.00973	.....	.....	.....	
1,519	155,000	.01316	.....	.....	.....	
1,568	160,000	.023	.....	.....	.....	Tensile strength.
1,586	161,840	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 161,840  
 Elastic limit per square inch of original section.....do... 125,000  
 Elongation per inch after rupture.....inch... .017  
 Elongation per inch under strain at elastic limit.....do .. .00576  
 Reduction in area after rupture, per centum of original section.....40.8  
 Position of rupture.....".25 outside the gauged section  
 Character of broken surface.....fine, silky

No. 4001.

Mark, No. 35.

Sectional area,  $.''0992 \times .''0993 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00078	.00078	.....	.....	
392	40,000	.00157	.00079	.....	.....	
588	60,000	.00227	.00070	.....	.....	
787	80,000	.00302	.00075	.....	.....	
980	100,000	.00387	.00085	.....	.....	
1,176	120,000	.00480	.00093	.....	.....	
1,225	125,000	.00498	.00018	.....	.....	
1,274	130,000	.00517	.00019	.....	.....	
1,323	135,000	.00547	.00030	.....	.....	
1,372	140,000	.00562	.00015	.....	.....	
1,421	145,000	.00598	.00036	.....	.....	
1,470	150,000	.00638	.00040	.....	.....	
1,519	155,000	.00679	.00041	.....	.....	Elastic limit.
1,568	160,000	.00728	.00051	.....	.....	
1,617	165,000	.00799	.00071	.....	.....	
1,666	170,000	.00900	.00101	.....	.....	
1,715	175,000	.01170	.00270	.....	.....	
1,754	180,000	.017	.0053	.....	.....	Tensile strength.
1,816	185,310	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 185,310  
 Elastic limit per square inch of original section ..... do .. 155,000  
 Elongation per inch after rupture ..... inch.. .025  
 Elongation per inch under strain at elastic limit ..... do... .00679  
 Reduction in area after rupture, per centum of original section ..... do.... 34.7  
 Position of rupture ..... 4", inside the gauged section  
 Character of broken surface ..... fine, silky

No. 4002.

Marks, No. 40.

Sectional area,  $''\cdot1002 \times ''\cdot1005 = .010$  square inch.Gauged length,  $10''$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00080	.00080	.....	.....	
400	40,000	.00160	.00080	.....	.....	
600	60,000	.00235	.00075	.....	.....	
800	80,000	.00310	.00075	.....	.....	
1,000	100,000	.00410	.00100	.....	.....	
1,200	120,000	.00515	.00105	.....	.....	
1,250	125,000	.00537	.00022	.....	.....	
1,300	130,000	.00565	.00028	.....	.....	
1,350	135,000	.00598	.00033	.....	.....	
1,400	140,000	.00637	.00039	.....	.....	Elastic limit.
1,450	145,000	.00679	.00042	.....	.....	
1,500	150,000	.00728	.00049	.....	.....	
1,550	155,000	.00795	.00067	.....	.....	
1,600	160,000	.00900	.00105	.....	.....	
1,650	165,000	.01040	.00140	.....	.....	
1,700	170,000	.015	.0046	.....	.....	
1,750	175,000	.022	.007	.....	.....	
1,760	176,000	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 176,000  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .024  
 Elongation per inch under strain at elastic limit. .... do... .00679  
 Reduction in area after rupture, per centum of original section ..... 33.0  
 Position of rupture.....  $1''\cdot6$  inside the gauged section  
 Character of broken surface..... fine silky

No. 4003.

Marks, No. 45.

Sectional area,  $''\text{.0988} \times ''\text{.0987} = \text{.0098 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00075	.00075	.....	.....	
392	40,000	.00150	.00075	.....	.....	
588	60,000	.00219	.00069	.....	.....	
784	80,000	.00304	.00085	.....	.....	
980	100,000	.00399	.00095	.....	.....	
1,176	120,000	.00474	.00075	.....	.....	
1,225	125,000	.00490	.00016	.....	.....	
1,274	130,000	.00519	.00029	.....	.....	
1,323	135,000	.00540	.00021	.....	.....	
1,372	140,000	.00572	.00032	.....	.....	
1,421	145,000	.00606	.00034	.....	.....	
1,470	150,000	.00644	.00038	.....	.....	Elastic limit.
1,519	155,000	.00694	.00050	.....	.....	
1,568	160,000	.00749	.00055	.....	.....	
1,617	165,000	.00813	.00064	.....	.....	
1,666	170,000	.01280	.00467	.....	.....	
1,715	175,000	.021	.0082	.....	.....	Tensile strength.
1,744	177,960	.....	.....	.....	.....	

*General summary.*

ensile strength per square inch of original section.....pounds.. 177,960  
 lastic limit per square inch of original section.....do... 150,000  
 longation per inch after rupture.....inch... .023  
 longation per inch under strain at elastic limit.....do... .00644  
 eduction in area after rupture, per centum of original section..... 36.7  
 osition of rupture..... 1''.75 inside the gauged section  
 haracter of broken surface .....fine silky



No. 4004.

Marks, No. 50.

Sectional area,  $''\text{.0983} \times ''\text{.0985} = \text{.0097}$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00079	.00079	.....	.....	
388	40,000	.00151	.00072	.....	.....	
582	60,000	.00233	.00082	.....	.....	
776	80,000	.00318	.00085	.....	.....	
970	100,000	.00423	.00105	.....	.....	
1,164	120,000	.00540	.00117	.....	.....	
1,212	125,000	.00568	.00028	.....	.....	
1,261	130,000	.00613	.00035	.....	.....	
1,309	135,000	.00653	.00050	.....	.....	
1,358	140,000	.00687	.00034	.....	.....	Elastic limit.
1,406	145,000	.00752	.00065	.....	.....	
1,455	150,000	.00817	.00065	.....	.....	
1,503	155,000	.00903	.00086	.....	.....	
1,552	160,000	.01020	.00117	.....	.....	
1,600	165,000	.012	.0018	.....	.....	
1,649	170,000	.017	.005	.....	.....	
1,683	173,510	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 173,510  
 Elastic limit per square inch of original section .....do... 140,000  
 Elongation per inch after rupture .....inch... .017  
 Elongation per inch under strain at elastic limit.....do... .00687  
 Reduction in area after rupture, per centum of original section ..... 37.1  
 Position of rupture .....1''/7 inside the gauged section  
 Character of broken surface.....fine silky

No. 4005.

Marks, No. 55.

Sectional area,  $''\text{.0984} \times ''\text{.0986} = \text{.0097}$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00072	.00072	.....	.....	
358	40,000	.00141	.00069	.....	.....	
582	60,000	.00221	.00080	.....	.....	
776	80,000	.00302	.00081	.....	.....	
970	100,000	.00392	.00090	.....	.....	
1,164	120,000	.00495	.00103	.....	.....	
1,212	125,000	.00518	.00023	.....	.....	
1,261	130,000	.00543	.00025	.....	.....	
1,309	135,000	.00589	.00046	.....	.....	
1,358	140,000	.00622	.00033	.....	.....	Elastic limit.
1,406	145,000	.00674	.00052	.....	.....	
1,455	150,000	.00761	.00087	.....	.....	
1,503	155,000	.00898	.00137	.....	.....	
1,552	160,000	.01215	.00317	.....	.....	
1,590	163,920	.....	.....	.....	.....	Tensile strength.

*General summary.*

ensile strength per square inch of original section .....pounds.. 163,920  
 lastic limit per square inch of original section.....do.. 140,000  
 longation per inch after rupture .....inch.. .008  
 longation per inch under strain at elastic limit.....do... .00622  
 eduction in area after rupture, per centum of original section ..... 34.0  
 osition of rupture .....in jaws of machine, outside gauged section  
 haracter of broken surface .....fine silky

## No. 4006.

Marks, No. 60.

Sectional area,  $''\text{.0992} \times ''\text{.0994} = \text{.0098 square inch.}$ 

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00082	.00082	.....	.....	
392	41,000	.00154	.00072	.....	.....	
588	60,000	.00232	.00078	.....	.....	
784	80,000	.00314	.00082	.....	.....	
980	100,000	.00412	.00098	.....	.....	
1,176	120,000	.00519	.00107	.....	.....	
1,225	125,000	.00544	.00025	.....	.....	
1,274	130,000	.00578	.00034	.....	.....	
1,323	135,000	.00618	.00040	.....	.....	Elastic limit.
1,372	140,000	.00668	.00050	.....	.....	
1,421	145,000	.00728	.00060	.....	.....	
1,470	150,000	.00828	.00100	.....	.....	
1,519	155,000	.00969	.00141	.....	.....	
1,568	160,000	.01262	.00293	.....	.....	
1,617	165,000	.021	.00538	.....	.....	
1,647	168,060	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds.. 168,060  
 Elastic limit per square inch of original section .....do... 135,000  
 Elongation per inch after rupture .....inch.. .021  
 Elongation per inch under strain at elastic limit .....do... .00618  
 Reduction in area after rupture, per centum of original section ..... 29.5  
 Position of rupture ..... 1".75 outside the gauged section  
 Character of broken surface.....fine silky

No. 4007.

Marks, No. 65.

Sectional area,  $''\cdot0990 \times ''\cdot0993 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00080	.00080	.....	.....	
592	40,000	.00157	.00077	.....	.....	
588	60,000	.00235	.00078	.....	.....	
784	80,000	.00315	.00080	.....	.....	
980	100,000	.00405	.00090	.....	.....	
1,176	120,000	.00504	.00099	.....	.....	
1,225	125,000	.00529	.00025	.....	.....	
1,274	130,000	.00555	.00026	.....	.....	
1,323	135,000	.00592	.00037	.....	.....	
1,372	140,000	.00625	.00033	.....	.....	Elastic limit.
1,421	145,000	.00665	.00040	.....	.....	
1,470	150,000	.00713	.00048	.....	.....	
1,519	155,000	.00769	.00056	.....	.....	
1,568	160,000	.00876	.00107	.....	.....	
1,617	165,000	.01072	.00196	.....	.....	
1,666	170,000	.016	.00528	.....	.....	Tensile strength.
1,714	174,900	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,900  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .015  
 Elongation per inch under strain at elastic limit ..... do... .00665  
 Reduction in area after rupture, per centum of original section ..... 34.7  
 Position of rupture ..... at end of gauged section  
 Character of broken surface..... fine silky

No. 4008.

Marks, No. 70.

Sectional area,  $''\text{.0985} \times ''\text{.0994} = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00078	.00078	.....	.....	
392	40,000	.00148	.00070	.....	.....	
588	60,000	.00218	.00070	.....	.....	
784	80,000	.00298	.00080	.....	.....	
980	100,000	.00380	.00082	.....	.....	
1,176	120,000	.00468	.00088	.....	.....	
1,225	125,000	.00488	.00020	.....	.....	
1,274	130,000	.00513	.00025	.....	.....	
1,323	135,000	.00538	.00025	.....	.....	
1,372	140,000	.00568	.00030	.....	.....	Elastic limit.
1,421	145,000	.00603	.00035	.....	.....	
1,470	150,000	.00641	.00038	.....	.....	
1,519	155,000	.00710	.00069	.....	.....	
1,568	160,000	.00851	.00141	.....	.....	
1,617	165,000	.01535	.00684	.....	.....	
1,666	170,000	.026	.01065	.....	.....	Tensile strength.
1,684	171,840	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 171,840  
 Elastic limit per square inch of original section.....do... 150,000  
 Elongation per inch after rupture.....inch... .018  
 Elongation per inch under strain at elastic limit.....do... .00641  
 Reduction in area after rupture, per centum of original section..... 37.8  
 Position of rupture .....1''.87 outside the gauged section  
 Character of broken surface.....fine silky

No. 4009.

Marks, No. 75.

Sectional area,  $''0990 \times ''0986 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00080	.00080	.....	.....	
392	40,000	.00157	.00077	.....	.....	
588	60,000	.00234	.00077	.....	.....	
784	80,000	.00321	.00087	.....	.....	
980	100,000	.00408	.00087	.....	.....	
1,176	120,000	.00508	.00100	.....	.....	
1,225	125,000	.00528	.00020	.....	.....	
1,274	130,000	.00551	.00023	.....	.....	
1,323	135,000	.00588	.00027	.....	.....	
1,372	140,000	.00618	.00030	.....	.....	Elastic limit.
1,421	145,000	.00658	.00040	.....	.....	
1,470	150,000	.00693	.00035	.....	.....	
1,519	155,000	.00750	.00057	.....	.....	
1,568	160,000	.00815	.00065	.....	.....	
1,617	165,000	.00896	.00081	.....	.....	
1,666	170,000	.01047	.00151	.....	.....	
1,715	175,000	.016	.00553	.....	.....	
1,764	180,000	.021	.005	.....	.....	
1,790	182,650	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 182,650  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do... .00693  
 Reduction in area after rupture, per centum of original section ..... 37.8  
 Position of rupture ..... 3''. 25 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4010.

Marks, No. 80.

Sectional area,  $''\text{.0990} \times ''\text{.0993} = \text{.0098}$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
40	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00082	.00082	.....	.....	
392	40,000	.00162	.00162	.....	.....	
588	60,000	.00240	.00240	.....	.....	
784	80,000	.00330	.00330	.....	.....	
980	100,000	.00424	.00424	.....	.....	
1,176	120,000	.00528	.00528	.....	.....	
1,225	125,000	.00552	.00552	.....	.....	
1,274	130,000	.00587	.00587	.....	.....	
1,323	135,000	.00622	.00622	.....	.....	
1,372	140,000	.00660	.00660	.....	.....	Elastic limit.
1,421	145,000	.00708	.00708	.....	.....	
1,470	150,000	.00758	.00758	.....	.....	
1,519	155,000	.00831	.00831	.....	.....	
1,568	160,000	.00922	.00922	.....	.....	
1,617	165,000	.01082	.01082	.....	.....	
1,666	170,000	.016	.00518	.....	.....	
1,715	175,000	.021	.005	.....	.....	
1,746	178,260	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 178,260  
 Elastic limit per square inch of original section.....do.. 140,000  
 Elongation per inch after rupture.....inch.. 0.016  
 Elongation per inch under strain at elastic limit.....do.. .00660  
 Reduction in area after rupture, per centum of original section..... 36.7  
 Position of rupture.....2'' .25 outside the gauged section  
 Character of broken surface.....fine silky

No. 4011.

Marks, No. 85.

Sectional area,  $''\text{.0995} \times ''\text{.0992} = \text{.0099 square inch.}$ 

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i> 40	<i>Pounds.</i> 5,000	<i>Inch.</i> 0.	<i>Inch.</i> 0.	<i>Inch.</i>	<i>Inch.</i>	Initial load.
198	20,000	.00078	.00078	.....	.....	
396	40,000	.00158	.00080	.....	.....	
594	60,000	.00240	.00082	.....	.....	
792	80,000	.00315	.00075	.....	.....	
990	100,000	.00399	.00084	.....	.....	
1,188	120,000	.00488	.00089	.....	.....	
1,237	125,000	.00510	.00022	.....	.....	
1,287	130,000	.00540	.00030	.....	.....	
1,336	135,000	.00567	.00027	.....	.....	
1,386	140,000	.00592	.00025	.....	.....	Elastic limit.
1,436	145,000	.00628	.00036	.....	.....	
1,485	150,000	.00667	.00039	.....	.....	
1,535	155,000	.00717	.00050	.....	.....	
1,584	160,000	.00774	.00057	.....	.....	
1,634	165,000	.00872	.00098	.....	.....	
1,683	170,000	.01141	.00269	.....	.....	Tensile strength.
1,732	174,950	.022	.01059	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,950  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... .011  
 Elongation per inch under strain at elastic limit ..... do... .00667  
 Reduction in area after rupture, per centum of original section ..... 43.4  
 Position of rupture ..... 4".25 outside the gauged section  
 Character of broken surface ..... fine silky



No. 4012.

Marks, No. 90.

Sectional area,  $''0.0982 \times ''0.0983 = .0096$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
192	20,000	.00072	.00072	.....	.....	
384	40,000	.00142	.00070	.....	.....	
576	60,000	.00220	.00078	.....	.....	
768	80,000	.00300	.00080	.....	.....	
960	100,000	.00387	.00087	.....	.....	
1,152	120,000	.00490	.00103	.....	.....	
1,200	125,000	.00510	.00020	.....	.....	
1,248	130,000	.00546	.00036	.....	.....	
1,296	135,000	.00590	.00044	.....	.....	
1,344	140,000	.00625	.00035	.....	.....	Elastic limit.
1,392	145,000	.00673	.00048	.....	.....	
1,440	150,000	.00740	.00067	.....	.....	
1,488	155,000	.00820	.00080	.....	.....	
1,536	160,000	.00992	.00172	.....	.....	
1,584	165,000	.01244	.00252	.....	.....	
1,632	170,000	.027	.01456	.....	.....	
1,650	171,875	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 171,875  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .023  
 Elongation per inch under strain at elastic limit ..... do... .00825  
 Reduction in area after rupture, per centum of original section ..... 33.3  
 Position of rupture ..... ''07 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4013.

Marks, No. 100.

Sectional area,  $''0986 \times ''0993 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
190	20,000	.00080	.00080	.....	.....	
392	40,000	.00159	.00079	.....	.....	
588	60,000	.00234	.00075	.....	.....	
784	80,000	.00314	.00080	.....	.....	
980	100,000	.00397	.00083	.....	.....	
1,176	120,000	.00493	.00096	.....	.....	
1,225	125,000	.00517	.00024	.....	.....	
1,274	130,000	.00549	.00032	.....	.....	
1,323	135,000	.00580	.00031	.....	.....	
1,372	140,000	.00615	.00035	.....	.....	Elastic limit.
1,421	145,000	.00675	.00060	.....	.....	
1,470	150,000	.00725	.00050	.....	.....	
1,519	155,000	.00845	.00120	.....	.....	
1,568	160,000	.01251	.00406	.....	.....	
1,617	165,000	.023	.01049	.....	.....	Tensile strength.
1,651	168,470	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....	pounds..	168,470
Elastic limit per square inch of original section.....	do...	140,000
Elongation per inch after rupture.....	inch..	.020
Elongation per inch under strain at elastic limit.....	do...	.00615
Reduction in area after rupture, per centum of original section.....		31.6
Position of rupture.....	4''.65 outside the gauged section	
Character of broken surface.....	fine silky	

No. 4014.

Marks, No. 110.

Sectional area,  $''\text{.0988} \times ''\text{.0990} = \text{.0098 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5, 000	0.	0.	0.	0.	Initial load.
196	20, 000	.00068	.00068	.....	.....	
392	40, 000	.00148	.00080	.....	.....	
588	60, 000	.00218	.00070	.....	.....	
784	80, 000	.00293	.00075	.....	.....	
980	100, 000	.00379	.00086	.....	.....	
1, 176	120, 000	.00478	.00099	.....	.....	
1, 275	125, 000	.00496	.00018	.....	.....	
1, 274	130, 000	.00520	.00024	.....	.....	
1, 323	135, 000	.00551	.00031	.....	.....	
1, 372	140, 000	.00588	.00037	.....	.....	Elastic limit.
1, 421	145, 000	.00628	.00040	.....	.....	
1, 470	150, 000	.00673	.00045	.....	.....	
1, 519	155, 000	.00755	.00082	.....	.....	
1, 568	160, 000	.00860	.00105	.....	.....	
1, 617	165, 000	.01183	.00323	.....	.....	
1, 666	170, 000	.027	.01517	.....	.....	Tensile strength.
1, 682	171, 630	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 171, 630  
 Elastic limit per square inch of original section .....do... 145, 000  
 Elongation per inch after rupture.....inch... .029  
 Elongation per inch under strain at elastic limit .....do... .00628  
 Reduction in area after rupture, per centum of original section..... 40. 8  
 Position of rupture.....3''.75 inside the gauged section  
 Character of broken surface.....fine silky

No. 4015.

Marks, No. 125.

Sectional area,  $''0.0994 \times ''0.0994 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00072	.00072	.....	.....	
396	40,000	.00144	.00072	.....	.....	
594	60,000	.00229	.00085	.....	.....	
792	80,000	.00309	.00080	.....	.....	
990	100,000	.00392	.00083	.....	.....	
1,188	120,000	.00493	.00101	.....	.....	
1,237	125,000	.00512	.00019	.....	.....	
1,287	130,000	.00542	.00030	.....	.....	
1,336	135,000	.00574	.00032	.....	.....	
1,386	140,000	.00615	.00041	.....	.....	Elastic limit.
1,436	145,000	.00659	.00044	.....	.....	
1,485	150,000	.00722	.00063	.....	.....	
1,535	155,000	.00830	.00108	.....	.....	
1,584	160,000	.01154	.00324	.....	.....	
1,628	164,440	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 164,440  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch.. .011  
 Elongation per inch under strain at elastic limit ..... do... .00615  
 Reduction in area after rupture, per centum of original section ..... 33.3  
 Position of rupture ..... 2''.95 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4016.

Marks, No. 130.

Sectional area,  $''\text{.0984} \times ''\text{.0991} = \text{.0097 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00072	.00072	.....	.....	
388	40,000	.00142	.00070	.....	.....	
582	60,000	.00220	.00078	.....	.....	
776	80,000	.00298	.00078	.....	.....	
970	100,000	.00376	.00088	.....	.....	
1,184	120,000	.00468	.00090	.....	.....	
1,212	125,000	.00487	.00019	.....	.....	
1,261	130,000	.00511	.00024	.....	.....	
1,309	135,000	.00538	.00027	.....	.....	
1,358	140,000	.00568	.00030	.....	.....	
1,406	145,000	.00599	.00031	.....	.....	
1,455	150,000	.00634	.00035	.....	.....	
1,503	155,000	.00672	.00038	.....	.....	
1,552	160,000	.00713	.00041	.....	.....	Elastic limit.
1,600	165,000	.00763	.00050	.....	.....	
1,649	170,000	.00840	.00077	.....	.....	
1,697	175,000	.00965	.00125	.....	.....	
1,746	180,000	.015	.00535	.....	.....	
1,794	185,000	.020	.005	.....	.....	Tensile strength.
1,816	187,220	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds .. 187,220  
 Elastic limit per square inch of original section ..... do... 160,000  
 Elongation per inch after rupture ..... inch... .022  
 Elongation per inch under strain at elastic limit ..... do... .00713  
 Reduction in area after rupture, per centum of original section ..... 48.5  
 Position of rupture ..... 2'' .8 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4017.

Marks, No. 135.

Sectional area,  $''\text{.0986} \times ''\text{.0984} = \text{.0097 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00078	.00078	.....	.....	
288	40,000	.00155	.00077	.....	.....	
582	60,000	.00231	.00076	.....	.....	
776	80,000	.00322	.00081	.....	.....	
970	100,000	.00417	.00085	.....	.....	
1,164	120,000	.00517	.00100	.....	.....	
1,212	125,000	.00538	.00021	.....	.....	
1,261	130,000	.00560	.00022	.....	.....	
1,309	135,000	.00603	.00043	.....	.....	
1,358	140,000	.00638	.00035	.....	.....	
1,406	145,000	.00678	.00040	.....	.....	
1,455	150,000	.00715	.00037	.....	.....	Elastic limit.
1,503	155,000	.00778	.00063	.....	.....	
1,552	160,000	.00845	.00067	.....	.....	
1,600	165,000	.00932	.00087	.....	.....	
1,649	170,000	.01078	.00146	.....	.....	
1,697	175,000	.016	.00522	.....	.....	Tensile strength.
1,742	179,590	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 179,590  
 Elastic limit per square inch of original section.....do... 150,000  
 Elongation per inch after rupture.....inch..... .020  
 Elongation per inch under strain at elastic limit.....do... .00715  
 Reduction in area after rupture, per centum of original section..... 32.0  
 Position of rupture.....4''.15 inside the gauged section  
 Character of broken surface.....fine silky

## No. 4018.

Marks, No. 140.

Sectional area,  $.0076 \times .0085 = .0096$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
44	5,000	0.	0.	0.	0.	Initial load.
192	20,000	.00071	.00071	.....	.....	
384	40,000	.00163	.00092	.....	.....	
576	60,000	.00250	.00087	.....	.....	
768	80,000	.00328	.00078	.....	.....	
960	100,000	.00418	.00090	.....	.....	
1,152	120,000	.00523	.00103	.....	.....	
1,200	125,000	.00512	.00019	.....	.....	
1,248	130,000	.00577	.00035	.....	.....	
1,296	135,000	.00608	.00031	.....	.....	
1,344	140,000	.00648	.00040	.....	.....	Elastic limit.
1,392	145,000	.00688	.00040	.....	.....	
1,440	150,000	.00758	.00070	.....	.....	
1,488	155,000	.00840	.00082	.....	.....	
1,536	160,000	.00970	.00130	.....	.....	
1,584	165,000	.01368	.00398	.....	.....	Tensile strength.
1,616	168,330	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 168,330  
 Elastic limit, per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .022  
 Elongation per inch under strain at elastic limit ..... do... .00688  
 Reduction in area after rupture, per centum of original section ..... 33.3  
 Position of rupture ..... 3/5 inside of gauged section  
 Character of broken surface ..... fine, silky

H. Ex. 165—32

No. 4019.

Marks, No. 145.

Sectional area,  $''0.0986 \times ''0.0987 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
45	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00085	.00085	.....	.....	
388	40,000	.00157	.00072	.....	.....	
582	60,000	.00238	.00081	.....	.....	
776	80,000	.00320	.00082	.....	.....	
970	100,000	.00410	.00090	.....	.....	
1,184	120,000	.00503	.00093	.....	.....	
1,212	125,000	.00528	.00025	.....	.....	
1,261	130,000	.00550	.00022	.....	.....	
1,309	135,000	.00582	.00032	.....	.....	
1,358	140,000	.00617	.00035	.....	.....	Elastic limit.
1,404	145,000	.00663	.00046	.....	.....	
1,455	150,000	.00702	.00039	.....	.....	
1,503	155,000	.00765	.00063	.....	.....	
1,552	160,000	.00823	.00058	.....	.....	
1,600	165,000	.00940	.00117	.....	.....	
1,649	170,000	.01140	.00200	.....	.....	
1,697	175,000	.017	.00560	.....	.....	
1,738	179,180	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds .. 179,180  
 Elastic limit per square inch of original section ..... do .. 150,000  
 Elongation per inch after rupture ..... inch .. .025  
 Elongation per inch under strain at elastic limit ..... do .. .00702  
 Reduction in area after rupture, per centum of original section ..... 42.3  
 Position of rupture ..... 2'' .1 inside the gauged section  
 Character of broken surface ..... fine, silky



No. 4020.

Marks, No. 150.

Sectional area,  $\cdot\cdot\cdot0987 \times \cdot\cdot\cdot0986 = \cdot\cdot\cdot0097$  square inch,

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
43	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00080	.00080	.....	.....	
388	40,000	.00152	.00072	.....	.....	
582	60,000	.00233	.00081	.....	.....	
776	80,000	.00315	.00082	.....	.....	
970	100,000	.00413	.00098	.....	.....	
1,164	120,000	.00516	.00103	.....	.....	
1,212	125,000	.00545	.00029	.....	.....	
1,261	130,000	.00576	.00031	.....	.....	
1,309	135,000	.00613	.00037	.....	.....	Elastic limit.
1,358	140,000	.0066	.00043	.....	.....	
1,406	145,000	.00718	.00062	.....	.....	
1,455	150,000	.00775	.00057	.....	.....	
1,503	155,000	.00873	.00098	.....	.....	
1,552	160,000	.01037	.00164	.....	.....	
1,600	165,000	.013	.00263	.....	.....	
1,649	170,000	.023	.010	.....	.....	
1,682	173,400	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 173,400  
 Elastic limit per square inch of original section.....do... 135,000  
 Elongation per inch after rupture.....inch.. 0.020  
 Elongation per inch under strain at elastic limit.....do... 0.00613  
 Reduction in area after rupture, per centum of original section.....40.2  
 Position of rupture.....2".5 inside the gauged section  
 Character of broken surface.....fine silk

No. 4021.

Marks, No. 155.

Sectional area,  $''\text{.0990} \times ''\text{.0990} = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00078	.00078	.....	.....	
392	40,000	.00168	.00090	.....	.....	
588	60,000	.00247	.00079	.....	.....	
784	80,000	.00330	.00083	.....	.....	
980	100,000	.00428	.00098	.....	.....	
1,176	120,000	.00533	.00105	.....	.....	
1,225	125,000	.00552	.00019	.....	.....	
1,274	130,000	.00591	.00039	.....	.....	
1,323	135,000	.00628	.00037	.....	.....	
1,372	140,000	.00667	.00039	.....	.....	Elastic limit.
1,421	145,000	.00717	.00050	.....	.....	
1,470	150,000	.00772	.00055	.....	.....	
1,519	155,000	.00845	.00073	.....	.....	
1,568	160,000	.00933	.00088	.....	.....	
1,617	165,000	.01088	.00155	.....	.....	
1,666	170,000	.014	.00312	.....	.....	
1,715	175,000	.020	.006	.....	.....	
1,746	178,160	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 178,160  
 Elastic limit per square inch of original section.....do .. 140,000  
 Elongation per inch after rupture.....inch..... .026  
 Elongation per inch under strain at elastic limit.....do..... .00667  
 Reduction in area after rupture, per centum of original section..... 37.8  
 Position of rupture..... 2''.75 inside the gauged section  
 Character of broken surface.....fine silky

No. 4022.

Marks, No. 165.

Sectional area,  $".0983 \times ".0986 = .0097$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00079	.00079	.....	.....	
388	40,000	.00155	.00155	.....	.....	
582	60,000	.00234	.00234	.....	.....	
776	80,000	.00312	.00312	.....	.....	
970	100,000	.00333	.00333	.....	.....	
1,164	120,000	.00470	.00470	.....	.....	
1,212	125,000	.00497	.00497	.....	.....	
1,261	130,000	.00528	.00528	.....	.....	
1,309	135,000	.00557	.00557	.....	.....	
1,358	140,000	.00591	.00591	.....	.....	Elastic limit.
1,406	145,000	.00634	.00634	.....	.....	
1,455	150,000	.00678	.00678	.....	.....	
1,503	155,000	.00778	.00778	.....	.....	
1,552	160,000	.01003	.01003	.....	.....	
1,594	164,330	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 164,330  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .007  
 Elongation per inch under strain at elastic limit ..... do... .00591  
 Reduction in area after rupture, per centum of original section ..... 40.2  
 Position of rupture ..... in jaws of machine outside gauged section  
 Character of broken surface ..... fine silky

No. 4023.

Marks, No. 170.

Sectional area,  $''\text{.0086} \times ''\text{.0087} = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00079	.00079	.....	.....	
388	40,000	.00162	.00083	.....	.....	
582	60,000	.00247	.00085	.....	.....	
776	80,000	.00327	.00080	.....	.....	
970	100,000	.00410	.00083	.....	.....	
1,164	120,000	.00503	.00093	.....	.....	
1,212	125,000	.00530	.00027	.....	.....	
1,261	130,000	.00553	.00023	.....	.....	
1,309	135,000	.00587	.00034	.....	.....	
1,358	140,000	.00617	.00030	.....	.....	
1,406	145,000	.00650	.00033	.....	.....	Elastic limit.
1,455	150,000	.00702	.00052	.....	.....	
1,503	155,000	.00750	.00048	.....	.....	
1,552	160,000	.00813	.00063	.....	.....	
1,600	165,000	.00911	.00098	.....	.....	
1,649	170,000	.01095	.00184	.....	.....	
1,697	175,000	.018	.00705	.....	.....	
1,718	177,110	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 177,110  
 Elastic limit per square inch of original section.....do.. 145,000  
 Elongation per inch after rupture.....inch.. .010  
 Elongation per inch under strain at elastic limit.....do... .00650  
 Reduction in area after rupture, per centum of original section.....40.2  
 Position of rupture.....3'' .5 outside the gauged section  
 Character of broken surface.....fine silky

No. 4024.

Marks, No. 175.

Sectional area,  $.0984 \times .0985 = .0097$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00077	.00077	.....	.....	
388	40,000	.00155	.00078	.....	.....	
882	60,000	.00235	.00080	.....	.....	
776	80,000	.00315	.00080	.....	.....	
970	100,000	.00413	.00098	.....	.....	
1,164	120,000	.00513	.00100	.....	.....	
1,212	125,000	.00540	.00027	.....	.....	
1,261	130,000	.00570	.00030	.....	.....	
1,309	135,000	.00609	.00039	.....	.....	
1,358	140,000	.00645	.00036	.....	.....	Elastic limit.
1,406	145,000	.00693	.00048	.....	.....	
1,455	150,000	.00747	.00054	.....	.....	
1,503	155,000	.00813	.00066	.....	.....	
1,552	160,000	.00915	.00102	.....	.....	
1,600	165,000	.01087	.00152	.....	.....	
1,649	170,000	.016	.00533	.....	.....	
1,697	175,000	.028	.012	.....	.....	
1,700	175,260	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 175,260  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... .014  
 Elongation per inch under strain at elastic limit.....do... .00645  
 Reduction in area after rupture, per centum of original section..... .37.1  
 Position of rupture.....6".2 outside of the gauged section  
 Character of broken surface.....fine silky

No. 4025.

Marks, No. 180.

Sectional area,  $".0986 \times ".0988 = .0097$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00087	.00087	.....	.....	
388	40,000	.00159	.00072	.....	.....	
582	60,000	.00238	.00079	.....	.....	
776	80,000	.00316	.00078	.....	.....	
970	100,000	.00408	.00092	.....	.....	
1,164	120,000	.00497	.00089	.....	.....	
1,212	125,000	.00518	.00021	.....	.....	
1,261	130,000	.00547	.00029	.....	.....	
1,309	135,000	.00577	.00030	.....	.....	
1,358	140,000	.00617	.00040	.....	.....	Elastic limit.
1,406	145,000	.00652	.00035	.....	.....	
1,455	150,000	.00698	.00046	.....	.....	
1,503	155,000	.00752	.00054	.....	.....	
1,552	160,000	.00837	.00085	.....	.....	
1,600	165,000	.01008	.00171	.....	.....	
1,649	170,000	.017	.00092	.....	.....	Tensile strength.
1,696	174,850	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 174,850  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .022  
 Elongation per inch under strain at elastic limit.....do... .00652  
 Reduction in area after rupture, per centum of original section..... 39.2  
 Position of rupture.....".55 inside the gauged section  
 Character of broken surface.....fine silky

No. 4026.

Marks, No. 185.

Sectional area,  $''\cdot0984 \times ''\cdot0988 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per-square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5 000	0.	0.	0.	0.	Initial load.
194	20,000	.00082	.00082	.....	.....	
388	40,000	.00165	.00083	.....	.....	
582	60,000	.00247	.00082	.....	.....	
776	80,000	.00331	.00084	.....	.....	
970	100,000	.00422	.00091	.....	.....	
1,164	120,000	.00523	.00101	.....	.....	
1,212	125,000	.00547	.00024	.....	.....	
1,261	130,000	.00577	.00030	.....	.....	
1,309	135,000	.00618	.00041	.....	.....	
1,358	140,000	.00658	.00040	.....	.....	Elastic limit.
1,406	145,000	.00708	.00050	.....	.....	
1,455	150,000	.00772	.00064	.....	.....	
1,503	155,000	.00862	.00090	.....	.....	
1,552	160,000	.01002	.00140	.....	.....	
1,600	165,000	.011	.00098	.....	.....	
1,649	170,000	.020	.009	.....	.....	
1,694	174,640	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section..... pounds .. 174,640  
 Elastic limit per square inch of original section..... do .. 140,000  
 Elongation per inch after rupture..... inch .. .024  
 Elongation per inch under strain at elastic limit..... do .. .00658  
 Reduction in area after rupture, per centum of original section..... 40.2  
 Position of rupture..... 2'' 8 inside the gauged section  
 Character of broken surface..... fine silky

No. 4027.

Marks, No. 190.

Sectional area,  $''\text{.0987} \times ''\text{.0984} = \text{.0097}$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00080	.00080	.....	.....	
388	40,000	.00158	.00078	.....	.....	
582	60,000	.00238	.00080	.....	.....	
776	80,000	.00338	.00100	.....	.....	
970	100,000	.00440	.00102	.....	.....	Elastic limit.
1,164	120,000	.00580	.00140	.....	.....	
1,212	125,000	.00613	.00033	.....	.....	
1,261	130,000	.00660	.00047	.....	.....	
1,309	135,000	.00733	.00073	.....	.....	
1,358	140,000	.00798	.00065	.....	.....	
1,406	145,000	.00925	.00127	.....	.....	
1,445	150,000	.01040	.00115	.....	.....	
1,503	155,000	.013	.00260	.....	.....	
1,552	160,000	.018	.005	.....	.....	
1,576	162,470	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds.. 162,470  
 Elastic limit per square inch of original section ..... do... 125,000  
 Elongation per inch after rupture ..... inch..... .012  
 Elongation per inch under strain at elastic limit..... do... .00613  
 Reduction in area after rupture, per centum of original section..... 39.2  
 Position of rupture ..... 2''.95 outside the gauged section  
 Character of broken surface..... fine silky



No. 4028.

Marks, No. 200.

Sectional area,  $''0990 \times ''0992 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
296	20,000	.00073	.00073	.....	.....	
392	40,000	.00156	.00083	.....	.....	
588	60,000	.00233	.00077	.....	.....	
784	80,000	.00326	.00093	.....	.....	
980	100,000	.00428	.00102	.....	.....	Elastic limit.
1,176	120,000	.00548	.00120	.....	.....	
1,225	125,000	.00578	.00030	.....	.....	
1,274	130,000	.00618	.00040	.....	.....	
1,323	135,000	.00667	.00049	.....	.....	
1,372	140,000	.00713	.00045	.....	.....	
1,421	145,000	.00777	.00064	.....	.....	
1,470	150,000	.00837	.00060	.....	.....	
1,519	155,000	.00952	.00115	.....	.....	
1,568	160,000	.01105	.00153	.....	.....	
1,617	165,000	.016	.00495	.....	.....	Tensile strength.
1,660	169,390	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 169,390  
 Elastic limit per square inch of original section .....do... 130,000  
 Elongation per inch after rupture .....inch... .010  
 Elongation per inch under strain at elastic limit.....do... .00618  
 Reduction in area after rupture, per centum of original section..... 42.9  
 Position of rupture ..... 6''.35 outside the gauged section  
 Character of broken surface .....fine silky

No. 4029.

Marks, No. 205.

Sectional area,  $''\text{.0991} \times ''\text{.0993} = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00078	.00078	.....	.....	
392	40,000	.00150	.00072	.....	.....	
588	60,000	.00213	.00063	.....	.....	
784	80,000	.00308	.00095	.....	.....	
980	100,000	.00391	.00083	.....	.....	
1,176	120,000	.00480	.00089	.....	.....	
1,225	125,000	.00502	.00022	.....	.....	
1,274	130,000	.00529	.00027	.....	.....	
1,323	135,000	.00557	.00028	.....	.....	
1,372	140,000	.00584	.00027	.....	.....	
1,421	145,000	.00618	.00034	.....	.....	
1,470	150,000	.00650	.00032	.....	.....	
1,519	155,000	.00692	.00042	.....	.....	
1,568	160,000	.00728	.00036	.....	.....	Elastic limit.
1,617	165,000	.00789	.00061	.....	.....	
1,666	170,000	.00862	.00073	.....	.....	
1,715	175,000	.00996	.00128	.....	.....	
1,764	180,000	.01240	.00250	.....	.....	
1,813	185,000	.021	.00860	.....	.....	Tensile strength.
1,832	186,940	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 186,940  
 Elastic limit per square inch of original section ..... do... 160,000  
 Elongation per inch after rupture..... inch... .020  
 Elongation per inch under strain at elastic limit..... do... .00728  
 Reduction in area after rupture, per centum of original section..... 40.8  
 Position of rupture..... " 7 inside the gauged section  
 Character of broken surface..... fine silky

No. 4030.

Marks, No. 210.

Sectional area,  $''0984 \times ''0985 = .0097$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00081	.00081	.....	.....	
388	40,000	.00151	.00070	.....	.....	
582	60,000	.00230	.00079	.....	.....	
776	80,000	.00312	.00082	.....	.....	
970	100,000	.00398	.00086	.....	.....	
1,164	120,000	.00499	.00101	.....	.....	
1,212	125,000	.00521	.00022	.....	.....	
1,261	130,000	.00549	.00028	.....	.....	
1,309	135,000	.00586	.00037	.....	.....	
1,358	140,000	.00625	.00039	.....	.....	Elastic limit.
1,406	145,000	.00670	.00045	.....	.....	
1,455	150,000	.00720	.00050	.....	.....	
1,503	155,000	.00790	.00070	.....	.....	
1,552	160,000	.00877	.00087	.....	.....	
1,600	165,000	.01082	.00205	.....	.....	
1,649	170,000	.016	.00518	.....	.....	
1,692	174,430	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,430  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch.. .007  
 Elongation per inch under strain at elastic limit ..... do... .00625  
 Reduction in area after rupture, per centum of original section ..... 37.1  
 Position of rupture ..... 5".25 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4031.

Marks, No. 215.

Sectional area,  $''\text{.0984} \times ''\text{.0988} = \text{.0097}$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks..
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load. .
194	20,000	.00080	.00080	.....	.....	
388	40,000	.00157	.00077	.....	.....	
582	60,000	.00240	.00083	.....	.....	
776	80,000	.00330	.00090	.....	.....	
970	100,000	.00420	.00100	.....	.....	Elastic limit.
1,184	120,000	.00587	.00137	.....	.....	
1,212	125,000	.00590	.00023	.....	.....	
1,261	130,000	.00635	.00045	.....	.....	
1,309	135,000	.00680	.00045	.....	.....	
1,358	140,000	.00742	.00062	.....	.....	
1,406	145,000	.00818	.00076	.....	.....	
1,455	150,000	.00918	.00100	.....	.....	
1,503	155,000	.01060	.00142	.....	.....	
1,552	160,000	.016	.00540	.....	.....	
1,600	165,000	.021	.005	.....	.....	Tensile strength.
1,618	166,800	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 166,800  
 Elastic limit per square inch of original section ..... do... 125,000  
 Elongation per inch after rupture ..... inch.. .013  
 Elongation per inch under strain at elastic limit ..... do... .00590  
 Reduction in area after rupture, per centum of original section ..... 37.1  
 Position of rupture ..... 1''.35 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4032.

Marks, No. 220.

Sectional area,  $''0.0990 \times ''0.0993 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00073	.00073	.....	.....	
392	40,000	.00150	.00077	.....	.....	
588	60,000	.00231	.00081	.....	.....	
784	80,000	.00318	.00087	.....	.....	
980	100,000	.00408	.00090	.....	.....	
1,176	120,000	.00502	.00094	.....	.....	
1,225	125,000	.00528	.00026	.....	.....	
1,274	130,000	.00554	.00026	.....	.....	
1,323	135,000	.00584	.00030	.....	.....	
1,372	140,000	.00618	.00034	.....	.....	Elastic limit.
1,421	145,000	.00651	.00033	.....	.....	
1,470	150,000	.00692	.00041	.....	.....	
1,519	155,000	.00737	.00045	.....	.....	
1,568	160,000	.00788	.00051	.....	.....	
1,617	165,000	.00853	.00065	.....	.....	
1,666	170,000	.00958	.00105	.....	.....	
1,715	175,000	.01132	.00174	.....	.....	
1,764	180,000	.016	.00468	.....	.....	
1,813	185,000	.024	.008	.....	.....	Tensile strength.
1,837	187,450	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 187,450  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... .024  
 Elongation per inch under strain at elastic limit ..... do... .00692  
 Reduction in area after rupture, per centum of original section ..... 36.7  
 Position of rupture ..... 2'' 6 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4033.

Marks, No. 225.

Sectional area,  $''\text{.0986} \times ''\text{.0985} = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00071	.00071	.....	.....	
388	40,000	.00155	.00084	.....	.....	
582	60,000	.00227	.00072	.....	.....	
776	80,000	.00307	.00080	.....	.....	
970	100,000	.00394	.00087	.....	.....	
1,164	120,000	.00475	.00081	.....	.....	
1,212	125,000	.00495	.00020	.....	.....	
1,261	130,000	.00517	.00022	.....	.....	
1,309	135,000	.00540	.00023	.....	.....	
1,358	140,000	.00565	.00025	.....	.....	Elastic limit.
1,406	145,000	.00599	.00034	.....	.....	
1,455	150,000	.00629	.00030	.....	.....	
1,503	155,000	.00665	.00036	.....	.....	
1,552	160,000	.00717	.00052	.....	.....	
1,600	165,000	.00795	.00078	.....	.....	
1,649	170,000	.00915	.00120	.....	.....	
1,697	175,000	.01168	.00253	.....	.....	
1,746	180,000	.031	.01932	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 180,000  
 Elastic limit per square inch of original section ..... do .. 155,000  
 Elongation per inch after rupture ..... inch.. .028  
 Elongation per inch under strain at elastic limit ..... do... .00665  
 Reduction in area after rupture, per centum of original section ..... 36.1  
 Position of rupture ..... 1''.65 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4055.

Marks, No. 230.

Sectional area,  $''0984 \times ''0986 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
48	5,000	0.	0.	0.	0.	
194	20,000	.00078	.00078	.....	.....	
388	40,000	.00150	.00072	.....	.....	
582	60,000	.00237	.00087	.....	.....	
776	80,000	.00325	.00088	.....	.....	
970	100,000	.00400	.00075	.....	.....	
1,164	120,000	.00505	.00105	.....	.....	
1,212	125,000	.00525	.00020	.....	.....	
1,261	130,000	.00555	.00030	.....	.....	
1,309	135,000	.00580	.00025	.....	.....	Elastic limit.
1,358	140,000	.00610	.00030	.....	.....	
1,406	145,000	.00657	.00047	.....	.....	
1,455	150,000	.00705	.00048	.....	.....	
1,503	155,000	.00800	.00095	.....	.....	
1,552	160,000	.00905	.00105	.....	.....	
1,600	165,000	.01100	.00195	.....	.....	
1,649	170,000	.01575	.00475	.....	.....	
1,670	172,160	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 172,160  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... .010  
 Elongation per inch under strain at elastic limit.....do... .00610  
 Reduction in area after rupture, per centum of original section..... 39.2  
 Position of rupture.....7''.25 outside the gauged section  
 Character of broken surface.....fine silky

H. Ex. 165—33

No. 4056.

Marks, No. 235.

Sectional area,  $''\cdot0994 \times ''\cdot0995 = \cdot0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00072	.00072	.....	.....	
396	40,000	.00147	.00075	.....	.....	
594	60,000	.00227	.00080	.....	.....	
792	80,000	.00307	.00080	.....	.....	
990	100,000	.00394	.00087	.....	.....	
1,188	120,000	.00493	.00099	.....	.....	
1,237	125,000	.00513	.00020	.....	.....	
1,287	130,000	.00540	.00027	.....	.....	
1,336	135,000	.00572	.00032	.....	.....	
1,386	140,000	.00610	.00038	.....	.....	Elastic limit.
1,436	145,000	.00653	.00043	.....	.....	
1,485	150,000	.00710	.00057	.....	.....	
1,535	155,000	.00778	.00068	.....	.....	
1,584	160,000	.00887	.00109	.....	.....	
1,634	165,000	.01085	.00198	.....	.....	
1,683	170,000	.01570	.00483	.....	.....	
1,712	172,930	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 172,930  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... .019  
 Elongation per inch under strain at elastic limit.....do... .00610  
 Reduction in area after rupture, per centum of original section.....35.4  
 Position of rupture.....".35 inside the gauged section  
 Character of broken surface.....fine silky



No. 4057.

Marks, No. 240.

Sectional area,  $''\cdot0994 \times ''\cdot0993 = \cdot0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
193	20,000	.00078	.00078	.....	.....	
396	40,000	.00156	.00078	.....	.....	
594	60,000	.00230	.00074	.....	.....	
792	80,000	.00318	.00088	.....	.....	
990	100,000	.00408	.00390	.....	.....	
1,198	120,000	.00508	.00100	.....	.....	
1,237	125,000	.00532	.00024	.....	.....	
1,287	130,000	.00558	.00026	.....	.....	
1,336	135,000	.00591	.00033	.....	.....	
1,386	140,000	.00630	.00039	.....	.....	Elastic limit.
1,436	145,000	.00667	.00037	.....	.....	
1,485	150,000	.00710	.00043	.....	.....	
1,535	155,000	.00772	.00062	.....	.....	
1,584	160,000	.00840	.00068	.....	.....	
1,634	165,000	.00975	.00135	.....	.....	
1,683	170,000	.01165	.00190	.....	.....	Tensile strength.
1,733	175,000	.01565	.00400	.....	.....	
1,778	179,600	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 179,600  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do... .00667  
 Reduction in area after rupture, per centum of original section ..... 33.3  
 Position of rupture ..... 1''.70 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4058.

Marks, No. 245.

Sectional area,  $''\text{.0986} \times ''\text{.0987} = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00081	.00081	.....	.....	
348	40,000	.00161	.00080	.....	.....	
582	60,000	.00244	.00083	.....	.....	
776	80,000	.00330	.00086	.....	.....	
970	100,000	.00427	.00097	.....	.....	
1,164	120,000	.00529	.00102	.....	.....	
1,212	125,000	.00568	.00039	.....	.....	
1,261	130,000	.00600	.00032	.....	.....	
1,309	135,000	.00635	.00035	.....	.....	Elastic limit.
1,358	140,000	.00680	.00045	.....	.....	
1,406	145,000	.00730	.00050	.....	.....	
1,455	150,000	.00812	.00080	.....	.....	
1,503	155,000	.00885	.00073	.....	.....	
1,552	160,000	.01047	.00162	.....	.....	
1,600	165,000	.01265	.00218	.....	.....	
1,649	170,000	.01775	.00510	.....	.....	
1,688	174,020	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,020  
 Elastic limit per square inch of original section ..... do... 135,000  
 Elongation per inch after rupture ..... inch... .025  
 Elongation per inch under strain at elastic limit ..... do... .00635  
 Reduction in area after rupture, per centum of original section ..... 34.0  
 Position of rupture ..... 1''.20 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4059.

Marks, No. 250.

Sectional area,  $''0978 \times ''0987 = .0096$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
48	5,000	0.	0.	0.	0.	
192	20,000	.00074	.00074	.....	.....	
384	40,000	.00150	.00076	.....	.....	
576	60,000	.00224	.00074	.....	.....	
768	80,000	.00312	.00078	.....	.....	
960	100,000	.00384	.00082	.....	.....	
1,152	120,000	.00472	.00088	.....	.....	
1,200	125,000	.00498	.00096	.....	.....	
1,248	130,000	.00520	.00022	.....	.....	
1,296	135,000	.00552	.00032	.....	.....	
1,344	140,000	.00589	.00037	.....	.....	
1,392	145,000	.006.8	.00039	.....	.....	
1,440	150,000	.00668	.00040	.....	.....	
1,488	155,000	.00724	.00056	.....	.....	Elastic limit.
1,536	160,000	.00805	.00081	.....	.....	
1,584	165,000	.00892	.00087	.....	.....	
1,632	170,000	.01110	.00218	.....	.....	
1,680	175,000	.01586	.00476	.....	.....	
1,694	176,460	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 176,460  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... .010  
 Elongation per inch under strain at elastic limit ..... do... .00668  
 Reduction in area after rupture, per centum of original section ..... 36.5  
 Position of rupture ..... 11''.10 outside the gauged section  
 Character of broken surface ..... fine silky

## No. 4060.

Marks, No. 255.

Sectional area,  $''\text{.0988} \times ''\text{.0988} = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00082	.00082	.....	.....	
392	40,000	.00150	.00068	.....	.....	
588	60,000	.00234	.00084	.....	.....	
784	80,000	.00320	.00086	.....	.....	
980	100,000	.00402	.00082	.....	.....	
1,176	120,000	.00499	.00097	.....	.....	
1,225	125,000	.00521	.00029	.....	.....	
1,274	130,000	.00550	.00029	.....	.....	
1,323	135,000	.00582	.00032	.....	.....	
1,372	140,000	.00621	.00039	.....	.....	Elastic limit.
1,421	145,000	.00668	.00047	.....	.....	
1,470	150,000	.00723	.00055	.....	.....	
1,519	155,000	.00797	.00074	.....	.....	
1,568	160,000	.00930	.00133	.....	.....	
1,617	165,000	.01240	.00310	.....	.....	Tensile strength.
1,650	168,370	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 168,370  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... .011  
 Elongation per inch under strain at elastic limit.....do... .00621  
 Reduction in area after rupture, per centum of original section..... 37.8  
 Position of rupture.....2'' .25 outside the gauged section  
 Character of broken surface.....fine silky

No. 4061.

Marks, No. 260.

Sectional area,  $".0987 \times ".0993 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00072	.00072	.....	.....	
392	40,000	.00150	.00078	.....	.....	
588	60,000	.00225	.00075	.....	.....	
784	80,000	.00305	.00080	.....	.....	
980	100,000	.00388	.00083	.....	.....	
1,176	120,000	.00479	.00091	.....	.....	
1,225	125,000	.00499	.00020	.....	.....	
1,274	130,000	.00532	.00033	.....	.....	
1,323	135,000	.00549	.00017	.....	.....	
1,372	140,000	.00585	.00036	.....	.....	Elastic limit.
1,421	145,000	.00605	.00020	.....	.....	
1,470	150,000	.00630	.00025	.....	.....	
1,519	155,000	.00665	.00035	.....	.....	
1,568	160,000	.00707	.00042	.....	.....	
1,617	165,000	.00790	.00083	.....	.....	
1,666	170,000	.00875	.00085	.....	.....	
1,715	175,000	.00990	.00115	.....	.....	
1,764	180,000	.01190	.00200	.....	.....	
1,813	185,000	.021	.00910	.....	.....	
1,839	187,650	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds.. 187,650  
 Elastic limit per square inch of original section .....do .. 155,000  
 Elongation per inch after rupture .....inch.. .022  
 Elongation per inch under strain at elastic limit .....do... .00665  
 Reduction in area after rupture, per centum of original section ..... 26.7  
 Position of rupture .....1".60 inside the gauged section  
 Character of broken surface.....fine silky

No. 4062.

Marks, No. 265.

Sectional area,  $".0984 \times ".0994 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00075	.00075	.....	.....	
392	40,000	.00152	.00077	.....	.....	
588	60,000	.00234	.00082	.....	.....	
784	80,000	.00318	.00084	.....	.....	
980	100,000	.00410	.00092	.....	.....	
1,176	120,000	.00510	.00100	.....	.....	
1,225	125,000	.00537	.00027	.....	.....	
1,274	130,000	.00578	.00041	.....	.....	
1,323	135,000	.00593	.00025	.....	.....	
1,372	140,000	.00630	.00037	.....	.....	Elastic limit.
1,421	145,000	.00675	.00045	.....	.....	
1,570	150,000	.00720	.00045	.....	.....	
1,519*	155,000	.00784	.00064	.....	.....	
1,568	160,000	.00887	.00103	.....	.....	
1,617	165,000	.01048	.00161	.....	.....	
1,666	170,000	.01560	.00512	.....	.....	
1,715	175,000	.027	.01140	.....	.....	
						Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 175,000  
Elastic limit per square inch of original section.....do... 140,000  
Elongation per inch after rupture.....inch... .026  
Elongation per inch under strain at elastic limit.....do... .00630  
Reduction in area after rupture, per centum of original section..... 31.6  
Position of rupture.....4".57 inside the gauged section  
Character of broken surface.....fine silky

No. 4063.

Marks, No. 270.

Sectional area,  $''\cdot0990 \times ''\cdot0992 = \cdot0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00077	.00077	.....	.....	
392	40,000	.00157	.00080	.....	.....	
588	60,000	.00230	.00073	.....	.....	
784	80,000	.00312	.00082	.....	.....	
980	100,000	.00399	.00087	.....	.....	
1,176	120,000	.00492	.00093	.....	.....	
1,225	125,000	.00517	.00025	.....	.....	
1,274	130,000	.00548	.00031	.....	.....	
1,323	135,000	.00578	.00030	.....	.....	
1,372	140,000	.00611	.00033	.....	.....	
1,421	145,000	.00650	.00039	.....	.....	Elastic limit.
1,470	150,000	.00695	.00045	.....	.....	
1,519	155,000	.00755	.00060	.....	.....	
1,568	160,000	.00838	.00083	.....	.....	
1,617	165,000	.00972	.00134	.....	.....	
1,666	170,000	.01275	.00303	.....	.....	
1,715	175,000	.022	.00925	.....	.....	
1,742	177,760	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 177,760  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .026  
 Elongation per inch under strain at elastic limit.....do... .00650  
 Reduction in area after rupture, per centum of original section.....34.7  
 Position of rupture.....4''.25 inside the gauged section  
 Character of broken surface.....fine silky

No. 4064.

Marks, No. 275.

Sectional area,  $".0992 \times ".0991 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00074	.00074	.....	.....	
392	40,000	.00148	.00074	.....	.....	
588	60,000	.00228	.00080	.....	.....	
784	80,000	.00310	.00092	.....	.....	
980	100,000	.00400	.00090	.....	.....	
1,176	120,000	.00498	.00098	.....	.....	
1,225	125,000	.00518	.00020	.....	.....	
1,274	130,000	.00552	.00034	.....	.....	
1,323	135,000	.00587	.00035	.....	.....	Elastic limit.
1,372	140,000	.00628	.00041	.....	.....	
1,421	145,000	.00685	.00057	.....	.....	
1,470	150,000	.00775	.00090	.....	.....	
1,519	155,000	.00940	.00165	.....	.....	
1,568	160,000	.01520	.00580	.....	.....	
1,617	165,000	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 165,000  
 Elastic limit per square inch of original section ..... do... 135,000  
 Elongation per inch after rupture ..... inch.. .030  
 Elongation per inch under strain at elastic limit ..... do... .00587  
 Reduction in area after rupture, per centum of original section ..... 39.8  
 Position of rupture ..... 2".12 inside the gauged section  
 Character of broken surface ..... fine silky



No. 4065.

Marks, No. 280.

Sectional area,  $''\text{.0986} \times ''\text{.0986} = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
48	5,000	0.	0.	0.	0.	
194	20,000	.00071	.00071	.....	.....	
338	40,000	.00142	.00071	.....	.....	
582	60,000	.00230	.00088	.....	.....	
776	80,000	.00307	.00077	.....	.....	
970	100,000	.00388	.00081	.....	.....	
1,164	120,000	.00488	.00100	.....	.....	
1,212	125,000	.00507	.00019	.....	.....	
1,261	130,000	.00527	.00020	.....	.....	
1,309	135,000	.00557	.00030	.....	.....	
1,358	140,000	.00585	.00028	.....	.....	
1,406	145,000	.00620	.00035	.....	.....	
1,455	150,000	.00655	.00035	.....	.....	Elastic limit.
1,503	155,000	.00700	.00045	.....	.....	
1,552	160,100	.00760	.00060	.....	.....	
1,600	165,000	.00847	.00087	.....	.....	
1,649	170,000	.01005	.00158	.....	.....	
1,697	175,000	.01240	.00235	.....	.....	Tensile strength.
1,746	180,000	.01720	.00480	.....	.....	
1,781	183,610	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 183,610  
 Elastic limit per square inch of original section.....do .. 150,000  
 Elongation per inch after rupture.....inch.. .020  
 Elongation per inch under strain at elastic limit.....do .. .00655  
 Reduction in area after rupture, per centum of original section..... 37.1  
 Position of rupture.....2''/48 inside the gauged section  
 Character of broken surface.....fine silky

No. 4066.

Marks, No. 295.

Sectional area,  $''\text{.0990} \times ''\text{.0993} = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00073	.00073	.....	.....	
392	40,000	.00144	.00071	.....	.....	
588	60,000	.00218	.00074	.....	.....	
784	80,000	.00301	.00083	.....	.....	
980	100,000	.00386	.00085	.....	.....	
1,176	120,000	.00484	.00098	.....	.....	
1,225	125,000	.00499	.00015	.....	.....	
1,274	130,000	.00529	.00030	.....	.....	
1,323	135,000	.00559	.00030	.....	.....	
1,372	140,000	.00586	.00027	.....	.....	Elastic limit.
1,421	145,000	.00621	.00035	.....	.....	
1,470	150,000	.00666	.00045	.....	.....	
1,519	155,000	.00718	.00052	.....	.....	
1,568	160,000	.00765	.00047	.....	.....	
1,617	165,000	.00856	.00091	.....	.....	
1,666	170,000	.01045	.00189	.....	.....	
1,715	175,000	.01622	.00577	.....	.....	
1,728	176,330	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 176,330  
 Elastic limit per square inch of original section..... do .. 145,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do.... .00621  
 Reduction in area after rupture, per centum of original section..... 39.8  
 Position of rupture ..... 2".50 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4067.

Marks, No. 300.

Sectional area,  $''\text{.0987} \times ''\text{.0985} = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
104	20,000	.00078	.00078	.....	.....	
388	40,000	.00153	.00075	.....	.....	
582	60,000	.00230	.00077	.....	.....	
776	80,000	.00310	.00080	.....	.....	
970	100,000	.00395	.00085	.....	.....	
1,164	120,000	.00481	.00086	.....	.....	
1,212	125,000	.00506	.00025	.....	.....	
1,261	130,000	.00528	.00022	.....	.....	
1,309	135,000	.00556	.00028	.....	.....	
1,358	140,000	.00590	.00034	.....	.....	Elastic limit.
1,406	145,000	.00628	.00038	.....	.....	
1,455	150,000	.00685	.00057	.....	.....	
1,503	155,000	.00760	.00075	.....	.....	
1,552	160,000	.01252	.00492	.....	.....	Tensile strength.
1,563	161,130	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 161,130  
 Elastic limit per square inch of original section .....do .. 145,000  
 Elongation per inch after rupture ..... inch.. .010  
 Elongation per inch under strain at elastic limit. ....do .... .00628  
 Reduction in area after rupture, per centum of original section ..... 37.1  
 Position of rupture ..... 5''.20 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4068.

Marks, No. 310.

Sectional area,  $''\text{.0982} \times ''\text{.0986} = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00075	.00075	.....	.....	
388	40,000	.00148	.00073	.....	.....	
582	60,000	.00234	.00086	.....	.....	
776	80,000	.00312	.00078	.....	.....	
970	100,000	.00393	.00081	.....	.....	
1,164	120,000	.00477	.00084	.....	.....	
1,212	125,000	.00502	.00025	.....	.....	
1,261	130,000	.00526	.00024	.....	.....	
1,309	135,000	.00551	.00025	.....	.....	
1,358	140,000	.00577	.00026	.....	.....	Elastic limit.
1,406	145,000	.00610	.00033	.....	.....	
1,455	150,000	.00642	.00032	.....	.....	
1,503	155,000	.00696	.00054	.....	.....	
1,552	160,000	.00776	.00080	.....	.....	
1,600	165,000	.01231	.00455	.....	.....	Tensile strength.
1,632	168,250	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 168,250  
 Elastic limit per square inch of original section .....do .. 150,000  
 Elongation per inch after rupture .....inch..... .007  
 Elongation per inch under strain at elastic limit .....do..... .00642  
 Reduction in area after rupture, per centum of original section..... 37.1  
 Position of rupture .....5'' .95 outside the gauged section  
 Character of broken surface.....fine silky

No. 4069.

Marks No. 315.

Sectional area,  $".0990 \times ".0992 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00072	.00072	.....	.....	
392	40,000	.00149	.00077	.....	.....	
588	60,000	.00219	.00070	.....	.....	
784	80,000	.00302	.00083	.....	.....	
980	100,000	.00392	.00090	.....	.....	Elastic limit.
1,176	120,000	.00480	.00098	.....	.....	
1,225	125,000	.00512	.00022	.....	.....	
1,274	130,000	.00542	.00030	.....	.....	
1,323	135,000	.00574	.00032	.....	.....	
1,372	140,000	.00627	.00053	.....	.....	
1,421	145,000	.00672	.00045	.....	.....	
1,470	150,000	.00720	.00048	.....	.....	
1,519	155,000	.00813	.00093	.....	.....	
1,568	160,000	.00970	.00157	.....	.....	
1,617	165,000	.07450	.00480	.....	.....	Tensile strength.
1,628	166,120	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 166,120  
 Elastic limit per square inch of original section ..... do... 135,000  
 Elongation per inch after rupture ..... inch.. .012  
 Elongation per inch under strain of elastic limit..... do... .00574  
 Reduction in area after rupture, per centum of original section..... 31.6  
 Position of rupture ..... 1/25 inside the gauged section  
 Character of broken surface..... fine silky

No. 4070.

Marks, No. 320.

Sectional area,  $".1003 \times ".1006 = .0101$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
202	20,000	.00072	.00072	.....	.....	
404	40,000	.00142	.00070	.....	.....	
606	60,000	.00228	.00086	.....	.....	
808	80,000	.00308	.00080	.....	.....	
1,010	100,000	.00398	.00090	.....	.....	
1,212	120,000	.00488	.00090	.....	.....	
1,262	125,000	.00510	.00022	.....	.....	
1,313	130,000	.00547	.00037	.....	.....	
1,363	135,000	.00578	.00031	.....	.....	
1,414	140,000	.00615	.00037	.....	.....	Elastic limit.
1,464	145,000	.00662	.00047	.....	.....	
1,515	150,000	.00715	.00053	.....	.....	
1,565	155,000	.00785	.00070	.....	.....	
1,616	160,000	.00935	.00150	.....	.....	
1,666	165,000	.01395	.00460	.....	.....	Tensile strength.
1,684	166,730	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 166,730  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .007  
 Elongation per inch under strain at elastic limit ..... do... .00615  
 Reduction in area after rupture, per centum of original section ..... 38.6  
 Position of rupture ..... 5".30 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4071.

Marks, No. 325.

Sectional area,  $''0983 \times ''0986 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00077	.00077	.....	.....	
388	40,000	.00154	.00077	.....	.....	
582	60,000	.00232	.00078	.....	.....	
776	80,000	.00313	.00081	.....	.....	
970	100,000	.00417	.00104	.....	.....	Elastic limit.
1,164	120,000	.00520	.00103	.....	.....	
1,212	125,000	.00545	.00025	.....	.....	
1,261	130,000	.00588	.00043	.....	.....	
1,309	135,000	.00625	.00037	.....	.....	
1,358	140,000	.00670	.00045	.....	.....	
1,406	145,000	.00718	.00048	.....	.....	
1,455	150,000	.00768	.00050	.....	.....	
1,503	155,000	.00845	.00077	.....	.....	
1,552	160,000	.00990	.00145	.....	.....	
1,600	165,000	.01225	.00235	.....	.....	Tensile strength.
1,649	170,000	.02034	.00809	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 170,000  
 Elastic limit per square inch of original section ..... do... 135,000  
 Elongation per inch after rupture ..... inch... .013  
 Elongation per inch under strain at elastic limit..... do... .00625  
 Reduction in area after rupture, per centum of original section..... 34.0  
 Position of rupture ..... 5''.30 outside the gauged section  
 Character of broken surface..... fine silky

No. 4087.

Marks, No. 335.

Sectional area,  $''\cdot0983 \times ''\cdot0987 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00072	.00072	.....	.....	
388	40,000	.00151	.00079	.....	.....	
582	60,000	.00220	.00069	.....	.....	
776	80,000	.00305	.00085	.....	.....	
970	100,000	.00396	.00091	.....	.....	
1,164	120,000	.00515	.00119	.....	.....	Elastic limit.
1,213	125,000	.00535	.00020	.....	.....	
1,261	130,000	.00575	.00040	.....	.....	
1,309	135,000	.00618	.00043	.....	.....	
1,358	140,000	.00668	.00070	.....	.....	
1,406	145,000	.00730	.00062	.....	.....	
1,455	150,000	.00815	.00085	.....	.....	Tensile strength.
1,503	155,000	.01090	.00275	.....	.....	
1,552	160,000	.021	.0101	.....	.....	
1,586	163,500	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 163,500  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch..... .016  
 Elongation per inch under strain at elastic limit.....do... .00575  
 Reduction in area after rupture, per centum of original section..... 39.2  
 Position of rupture.....1''/40 outside the gauged section.  
 Character of broken surface.....fine silky



No. 4088.

Marks, No. 340.

Sectional area,  $''0.0993 \times ''0.0987 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00080	.00080	.....	.....	
392	40,000	.00160	.00080	.....	.....	
588	60,000	.00242	.00082	.....	.....	
784	80,000	.00319	.00077	.....	.....	
980	100,000	.00413	.00094	.....	.....	
1,176	120,000	.00519	.00106	.....	.....	
1,225	125,000	.00542	.00023	.....	.....	
1,274	130,000	.00674	.00032	.....	.....	
1,323	135,000	.00610	.00036	.....	.....	
1,372	140,000	.00647	.00037	.....	.....	Elastic limit.
1,421	145,000	.00700	.00053	.....	.....	
1,470	150,000	.00772	.00072	.....	.....	
1,519	155,000	.00878	.00106	.....	.....	
1,568	160,000	.01112	.00234	.....	.....	
1,617	165,000	.022	.01088	.....	.....	Tensile strength.
1,641	167,450	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 167,450  
 Elastic limit per square inch of original section ..... do.... 140,000  
 Elongation per inch after rupture ..... inch .. .028  
 Elongation per inch under strain at elastic limit ..... do.... .00647  
 Reduction in area after rupture, per centum of original section ..... 43.9  
 Position of rupture ..... .2''.15 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4089.

Marks, No. 360.

Sectional area,  $''\text{.0987} \times ''\text{.0986} = \text{.0097 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00079	.00079	.....	.....	
388	40,000	.00159	.00080	.....	.....	
582	60,000	.00235	.00076	.....	.....	
776	80,000	.00329	.00094	.....	.....	
970	100,000	.00429	.00100	.....	.....	Elastic limit.
1,164	120,000	.00562	.00133	.....	.....	
1,212	125,000	.00589	.00027	.....	.....	
1,261	130,000	.00638	.00049	.....	.....	
1,309	135,000	.00708	.00070	.....	.....	
1,358	140,000	.00777	.00069	.....	.....	Tensile strength.
1,406	145,000	.00906	.00129	.....	.....	
1,455	150,000	.01062	.00156	.....	.....	
1,503	155,000	.017	.00638	.....	.....	
1,546	159,380	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 159,380  
 Elastic limit per square inch of original section ..... do... 125,000  
 Elongation per inch after rupture ..... inch... .023  
 Elongation per inch under strain at elastic limit ..... .00589  
 Reduction in area after rupture, per centum of original section ..... 36.1  
 Position of rupture ..... 3" 1 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4090.

Marks, No. 365.

Sectional area,  $''0988 \times ''0988 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
190	20,000	.00077	.00077	.....	.....	
392	40,000	.00155	.00078	.....	.....	
588	60,000	.00234	.00079	.....	.....	
784	80,000	.00321	.00087	.....	.....	
980	100,000	.00420	.00099	.....	.....	
1,176	120,000	.00544	.00124	.....	.....	
1,225	125,000	.00577	.00033	.....	.....	
1,274	130,000	.00613	.00036	.....	.....	Elastic limit.
1,323	135,000	.00667	.00054	.....	.....	
1,372	140,000	.00727	.00060	.....	.....	
1,421	145,000	.00810	.00083	.....	.....	
1,470	150,000	.00932	.00122	.....	.....	
1,519	155,000	.01170	.00238	.....	.....	
1,568	160,000	.019	.00730	.....	.....	
1,597	162,960	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 162,960  
 Elastic limit per square inch of original section ..... do... 130,000  
 Elongation per inch after rupture ..... inch.. .017  
 Elongation per inch under strain at elastic limit ..... do... .00613  
 Reduction in area after rupture, per centum of original section ..... 49.0  
 Position of rupture ..... '' .75 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4091.

Marks, No. 370.

Sectional area,  $''\cdot0996 \times ''\cdot0999 = \cdot010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00088	.00088	.....	.....	
400	40,000	.00178	.00090	.....	.....	
600	60,000	.00249	.00071	.....	.....	
800	80,000	.00338	.00089	.....	.....	
1,000	100,000	.00427	.00089	.....	.....	
1,200	120,000	.00520	.00093	.....	.....	
1,250	125,000	.00545	.00025	.....	.....	
1,300	130,000	.00572	.00027	.....	.....	Elastic limit.
1,350	135,000	.00605	.00033	.....	.....	
1,400	140,000	.00635	.00030	.....	.....	
1,450	145,000	.00675	.00040	.....	.....	
1,500	150,000	.00728	.00053	.....	.....	
1,550	155,000	.00890	.00072	.....	.....	
1,600	160,000	.00895	.00095	.....	.....	
1,650	165,000	.01060	.00165	.....	.....	
1,700	170,000	.01435	.00375	.....	.....	
1,750	175,000	.029	.01465	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	175,000
Elastic limit per square inch of original section.....	do ..	145,000
Elongation per inch after rupture.....	inch..	.029
Elongation per inch under strain at elastic limit.....	do ..	.00675
Reduction in area after rupture, per centum of original section.....		45.0
Position of rupture.....	4''·7 inside the gauged section	
Character of broken surface.....	fine, silky	

No. 4092.

Marks, No. 375.

Sectional area,  $".0995 \times ".0996 = .0099$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00081	.00081	.....	.....	
396	40,000	.00161	.00120	.....	.....	
594	60,000	.00241	.00080	.....	.....	
792	80,000	.00328	.00087	.....	.....	
990	100,000	.00418	.00090	.....	.....	
1,188	120,000	.00521	.00103	.....	.....	
1,237	125,000	.00547	.00026	.....	.....	
1,287	130,000	.00570	.00023	.....	.....	
1,336	135,000	.00607	.00037	.....	.....	
1,386	140,000	.00650	.00043	.....	.....	Elastic limit.
1,436	145,000	.00687	.00037	.....	.....	
1,485	150,000	.00737	.00050	.....	.....	
1,535	155,000	.00810	.00073	.....	.....	
1,584	160,000	.00900	.00090	.....	.....	
1,634	165,000	.01036	.00135	.....	.....	
1,683	170,000	.01317	.00282	.....	.....	
1,733	175,000	.023	.00973	.....	.....	
1,740	176,360	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds.. 176,36  
 Elastic limit per square inch of original section .....do... 145,00  
 Elongation per inch after rupture.....inch... .01  
 Elongation per inch under strain at elastic limit.....do... .0068  
 Reduction in area after rupture, per centum of original section..... 46.  
 Position of rupture.....". 25 outside the gauged section  
 Character of broken surface.....fine silk

No. 4093.

Marks, No. 380.

Sectional area,  $''0992 \times ''0980 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
195	20,000	.00073	.00073	.....	.....	
389	40,000	.00154	.00081	.....	.....	
582	60,000	.00229	.00075	.....	.....	
776	80,000	.00314	.00085	.....	.....	
970	100,000	.00404	.00090	.....	.....	
1,164	120,000	.00524	.00120	.....	.....	
1,212	125,000	.00552	.00028	.....	.....	
1,261	130,000	.00587	.00035	.....	.....	Elastic limit.
1,309	135,000	.00637	.00050	.....	.....	
1,358	140,000	.00687	.00050	.....	.....	
1,406	145,000	.00772	.00085	.....	.....	
1,455	150,000	.00920	.00148	.....	.....	
1,503	155,000	.01190	.00270	.....	.....	
1,552	160,000	.021	.00910	.....	.....	
1,596	164,540	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section..... pounds.. 164,540  
 Elastic limit per square inch of original section..... do... 130,000  
 Elongation per inch after rupture..... inch... 0.27  
 Elongation per inch under strain at elastic limit..... do... .00587  
 Reduction in area after rupture, per centum of original section..... 45.4  
 Position of rupture..... 1''.8 inside the gauged section  
 Character of broken surface..... fine silky

No. 4094.

Marks, No. 385.

Sectional area,  $''\text{.0985} \times ''\text{.0990} = \text{.0098 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
100	20,000	.00071	.00071	.....	.....	
392	40,000	.00148	.00077	.....	.....	
588	60,000	.00223	.00075	.....	.....	
784	80,000	.00305	.00082	.....	.....	
980	100,000	.00390	.00085	.....	.....	Elastic limit.
1,176	120,000	.00494	.00104	.....	.....	
1,225	125,000	.00510	.00016	.....	.....	
1,274	130,000	.00540	.00030	.....	.....	
1,323	135,000	.00576	.00036	.....	.....	
1,372	140,000	.00607	.00031	.....	.....	Tensile strength.
1,421	145,000	.00650	.00043	.....	.....	
1,470	150,000	.00710	.00060	.....	.....	
1,519	155,000	.00800	.00090	.....	.....	
1,568	160,000	.01012	.00212	.....	.....	
1,617	165,000	.021	.01088	.....	.....	
1,652	168,570	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 168,570  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch.. .024  
 Elongation per inch under strain at elastic limit ..... do... .00607  
 Reduction in area after rupture, per centum of original section ..... 45.9  
 Position of rupture ..... '' .45 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4095.

Marks, No. 390.

Sectional area,  $''0993 \times ''0994 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00070	.00070	-----	-----	
396	40,000	.00140	.00070	-----	-----	
594	60,000	.00217	.00077	-----	-----	
792	80,000	.00297	.00080	-----	-----	
990	100,000	.00377	.00080	-----	-----	
1,188	120,000	.00460	.00083	-----	-----	
1,237	125,000	.00479	.00019	-----	-----	
1,287	130,000	.00502	.00023	-----	-----	
1,336	135,000	.00525	.00023	-----	-----	
1,386	140,000	.00550	.00025	-----	-----	Elastic limit.
1,436	145,000	.00577	.00027	-----	-----	
1,485	150,000	.00617	.00040	-----	-----	
1,535	155,000	.00657	.00040	-----	-----	
1,584	160,000	.00722	.00065	-----	-----	
1,634	165,000	.00850	.00128	-----	-----	
1,683	170,000	.01300	.00450	-----	-----	
1,733	175,000	.026	.013	-----	-----	
1,745	176,260	-----	-----	-----	-----	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 176,260  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do... .00577  
 Reduction in area after rupture, per centum of original section ..... 41.4  
 Position of rupture ..... 3''.1 outside the gauged section  
 Character of broken surface ..... fine silky



No. 4096.

Marks, 395.

Sectional area,  $".0995 \times ".0987 = .0098$  square inch.

Gauged length, 10",

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.000070	.000070	.....	.....	
392	40,000	.000148	.000078	.....	.....	
588	60,000	.000231	.000083	.....	.....	
784	80,000	.000310	.000079	.....	.....	
980	100,000	.000398	.000088	.....	.....	Elastic limit.
1,176	120,000	.000498	.000100	.....	.....	
1,225	125,000	.000515	.000017	.....	.....	
1,274	130,000	.000558	.000043	.....	.....	
1,323	135,000	.000588	.000030	.....	.....	
1,372	140,000	.000617	.000020	.....	.....	
1,421	145,000	.000667	.000050	.....	.....	
1,470	150,000	.000725	.000058	.....	.....	
1,519	155,000	.000845	.000120	.....	.....	
1,568	160,000	.001137	.000292	.....	.....	
1,617	165,000	.024	.001263	.....	.....	Tensile strength.
1,646	167,960	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds .. 167,960  
 Elastic limit per square inch of original section ..... do .. 140,000  
 Elongation per inch after rupture ..... inch .. .022  
 Elongation per inch under strain at elastic limit ..... do .. .00617  
 Reduction in area after rupture, per centum of original section ..... 39.8  
 Position of rupture ..... ".70 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4097.

Marks, No. 400.

Sectional area,  $''0.0985 \times ''0.0988 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00082	.00082	.....	.....	
328	40,000	.00160	.00078	.....	.....	
582	60,000	.00247	.00087	.....	.....	
776	80,000	.00330	.00083	.....	.....	
970	100,000	.00422	.00092	.....	.....	
1,164	120,000	.00525	.00103	.....	.....	
1,212	125,000	.00548	.00023	.....	.....	
1,261	130,000	.00583	.00035	.....	.....	
1,309	135,000	.00625	.00042	.....	.....	
1,358	140,000	.00655	.00030	.....	.....	Elastic limit.
1,406	145,000	.00710	.00055	.....	.....	
1,455	150,000	.00758	.00048	.....	.....	
1,503	155,000	.00847	.00089	.....	.....	
1,552	160,000	.00951	.00104	.....	.....	
1,600	165,000	.01160	.00209	.....	.....	
1,649	170,000	.020	.0084	.....	.....	
1,679	173,090	.....	.....	.....	.....	Tensile strength.

Tensile strength per square inch of original section ..... pounds .. 173,090  
 Elastic limit per square inch of original section ..... do. .... 140,000  
 Elongation per inch after rupture ..... inch. .... .022  
 Elongation per inch under strain at elastic limit ..... do. .... .00655  
 Reduction in area after rupture, per centum of original section ..... 42.5  
 Position of rupture ..... 1'' inside the gauged section  
 Character of broken surface ..... fine silky

No. 4098.

Marks, 405.

Sectional area,  $''0994 \times ''0993 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00071	.00071	.....	.....	
396	40,000	.00157	.00086	.....	.....	
594	60,000	.00240	.00083	.....	.....	
792	80,000	.00333	.00093	.....	.....	
990	100,000	.00433	.00100	.....	.....	Elastic limit.
1,188	120,000	.00558	.00125	.....	.....	
1,237	125,000	.00587	.00029	.....	.....	
1,287	130,000	.00625	.00038	.....	.....	
1,336	135,000	.00672	.00047	.....	.....	
1,386	140,000	.00720	.00048	.....	.....	
1,436	145,000	.00782	.00062	.....	.....	
1,485	150,000	.00862	.00080	.....	.....	
1,535	155,000	.00967	.00105	.....	.....	
1,584	160,000	.01112	.00145	.....	.....	
1,634	165,000	.016	.00488	.....	.....	Tensile strength.
1,683	170,000	.021	.005	.....	.....	
1,704	172,120	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 172,120  
 Elastic limit per square inch of original section ..... do... 130,000  
 Elongation per inch after rupture ..... inch... .021  
 Elongation per inch under strain at elastic limit ..... do... .00625  
 Reduction in area after rupture, per centum of original section ..... 40.4  
 Position of rupture ..... 4'.5 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4099.

Marks, No. 410.

Sectional area,  $''\cdot0997 \times ''\cdot0997 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
108	20,000	.00075	.00075	.....	.....	
396	40,000	.00153	.00078	.....	.....	
594	60,000	.00232	.00079	.....	.....	
792	80,000	.00319	.00087	.....	.....	
990	100,000	.00410	.00091	.....	.....	Elastic limit.
1,188	120,000	.00527	.00117	.....	.....	
1,237	125,000	.00552	.00025	.....	.....	
1,287	130,000	.00590	.00038	.....	.....	
1,336	135,000	.00630	.00040	.....	.....	
1,386	140,000	.00680	.00050	.....	.....	
1,436	145,000	.00741	.00061	.....	.....	
1,485	150,000	.00822	.00081	.....	.....	
1,535	155,000	.00942	.00120	.....	.....	
1,584	160,000	.01165	.00223	.....	.....	
1,634	165,000	.017	.00535	.....	.....	Tensile strength.
1,683	170,000	.030	.013	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 170,000  
 Elastic limit per square inch of original section .....do... 135,000  
 Elongation per inch after rupture.....inch... .024  
 Elongation per inch under strain at elastic limit.....do... .00630  
 Reduction in area after rupture, per centum of original section..... 41.4  
 Position of rupture.....3''.2 inside the gauged section  
 Character of broken surface.....fine silky

No. 4100.

Marks, 415.

Sectional area,  $''0986 \times ''0985 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00077	.00077	.....	.....	
388	40,000	.00152	.00075	.....	.....	
582	60,000	.00228	.00076	.....	.....	
776	80,000	.00308	.00080	.....	.....	
970	100,000	.00390	.00082	.....	.....	
1,164	120,000	.00478	.00088	.....	.....	
1,212	125,000	.00497	.00019	.....	.....	
1,261	130,000	.00527	.00030	.....	.....	
1,309	135,000	.00548	.00021	.....	.....	
1,358	140,000	.00577	.00029	.....	.....	Elastic limit.
1,406	145,000	.00608	.00031	.....	.....	
1,455	150,000	.00648	.00040	.....	.....	
1,503	155,000	.00708	.00060	.....	.....	
1,552	160,000	.00825	.00117	.....	.....	
1,600	165,000	.01120	.00295	.....	.....	
1,649	170,000	.024	.01280	.....	.....	Tensile strength.
1,677	172,890	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 172,890  
 Elastic limit per square inch of original section. .... do... 150,000  
 Elongation per inch after rupture..... inch... .017  
 Elongation per inch under strain at elastic limit..... do .. .00648  
 Reduction in area after rupture, per centum of original section ..... 39.2  
 Position of rupture..... 5'' outside the gauged section  
 Character of broken surface..... fine silky

No. 4101.

Marks, No. 420.

Sectional area,  $''\text{.0996} \times ''\text{.0992} = .0099$  square inch.

Gauged length, 10''.

* Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00078	.00078	.....	.....	
396	40,000	.00154	.00076	.....	.....	
594	60,000	.00229	.00075	.....	.....	
792	80,000	.00321	.00092	.....	.....	
990	100,000	.00418	.00097	.....	.....	
1,188	120,000	.00523	.00105	.....	.....	
1,237	125,000	.00547	.00024	.....	.....	
1,287	130,000	.00580	.00033	.....	.....	
1,336	135,000	.00612	.00032	.....	.....	
1,386	140,000	.00654	.00042	.....	.....	Elastic limit.
1,436	145,000	.00712	.00058	.....	.....	
1,485	150,000	.00797	.00085	.....	.....	
1,535	155,000	.00917	.00120	.....	.....	
1,584	160,000	.01195	.00278	.....	.....	
1,634	165,000	.020	.00805	.....	.....	
1,671	168,790	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	168,790
Elastic limit per square inch of original section.....	do ..	140,000
Elongation per inch after rupture.....	inch..	.028
Elongation per inch under strain at elastic limit.....	do ..	.00854
Reduction in area after rupture, per centum of original section.....		38.4
Position of rupture.....	4."85 inside the gauged section	
Character of broken surface.....	fine silky	

## No. 4102.

Marks, No. 425.

Sectional area,  $''\text{.0987} \times ''\text{.0990} = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00073	.00073	.....	.....	
392	40,000	.00150	.00077	.....	.....	
588	60,000	.00230	.00080	.....	.....	
784	80,000	.00316	.00086	.....	.....	
980	100,000	.00420	.00104	.....	.....	
1,176	120,000	.00529	.00109	.....	.....	
1,225	125,000	.00569	.00040	.....	.....	
1,274	130,000	.00602	.00033	.....	.....	Elastic limit.
1,323	135,000	.00652	.00050	.....	.....	
1,372	140,000	.00700	.00048	.....	.....	
1,421	145,000	.00771	.00071	.....	.....	
1,470	150,000	.00860	.00089	.....	.....	
1,519	155,000	.01000	.00140	.....	.....	
1,568	160,000	.01245	.00245	.....	.....	
1,617	165,000	.017	.00455	.....	.....	
1,662	169,590	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original strength ..... pounds.. 169,590  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch... .027  
 Elongation per inch under strain at elastic limit.....do... .00602  
 Reduction in area after rupture, per centum of original section..... 37.8  
 Position of rupture.....3/4 inside the gauged section  
 Character of broken surface .....fine silky

H. Ex. 165—35

## No. 4103.

Marks, No. 430.

Sectional area,  $''\text{.0990} \times ''\text{.0993} = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00075	.00075	.....	.....	
392	40,000	.00162	.00087	.....	.....	
588	60,000	.00237	.00075	.....	.....	
784	80,000	.00327	.00090	.....	.....	
980	100,000	.00417	.00090	.....	.....	Elastic limit.
1,176	120,000	.00528	.00111	.....	.....	
1,225	125,000	.00556	.00028	.....	.....	
1,274	130,000	.00586	.00030	.....	.....	
1,323	135,000	.00625	.00039	.....	.....	
1,372	140,000	.00667	.00042	.....	.....	
1,421	145,000	.00722	.00055	.....	.....	
1,470	150,000	.00790	.00068	.....	.....	
1,519	155,000	.00885	.00095	.....	.....	
1,568	160,000	.01000	.00115	.....	.....	
1,617	165,000	.01220	.00220	.....	.....	Tensile strength.
1,666	170,000	.020	.00780	.....	.....	
1,703	173,780	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section..... pounds.. 173,780  
 Elastic limit per square inch of original section..... do... 135,000  
 Elongation per inch after rupture..... inch.. .012  
 Elongation per inch under strain at elastic limit..... do... .00624  
 Reduction in area after rupture, per centum of original section..... 37.8  
 Position of rupture..... 2'' .80 outside the gauged section  
 Character of broken surface..... fine silky



No. 4104.

Marks, No. 435.

Sectional area,  $''0995 \times ''0994 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
89	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00076	.00076	.....	.....	
396	40,000	.00155	.00079	.....	.....	
594	60,000	.00236	.00081	.....	.....	
792	80,000	.00318	.00082	.....	.....	
990	100,000	.00408	.00090	.....	.....	
1,188	120,000	.00511	.00103	.....	.....	
1,237	125,000	.00533	.00022	.....	.....	
1,287	130,000	.00560	.00027	.....	.....	
1,336	135,000	.00592	.00032	.....	.....	
1,386	140,000	.00628	.00036	.....	.....	Elastic limit.
1,436	145,000	.00665	.00037	.....	.....	
1,485	150,000	.00706	.00041	.....	.....	
1,535	155,000	.00765	.00059	.....	.....	
1,584	160,000	.00820	.00055	.....	.....	
1,634	165,000	.00901	.00081	.....	.....	
1,683	170,000	.01050	.00149	.....	.....	
1,733	175,000	.015	.00450	.....	.....	
1,782	180,000	.022	.007	.....	.....	
1,812	183,030	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 183,030  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .014  
 Elongation per inch under strain at elastic limit.....do .. .00665  
 Reduction in area after rupture, per centum of original section..... 32.3  
 Position of rupture.....2''.55 outside the gauged section  
 Character of broken surface.....fine silky

No. 4105.

Marks, No. 440.

Sectional area,  $\text{".1001} \times \text{".0998} = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00078	.00078	.....	.....	
400	40,000	.00161	.00083	.....	.....	
600	60,000	.00250	.00.89	.....	.....	
800	80,000	.00325	.00075	.....	.....	
1,000	100,000	.00400	.00075	.....	.....	
1,200	120,000	.00491	.00091	.....	.....	
1,250	125,000	.00510	.00091	.....	.....	
1,300	130,000	.00537	.00027	.....	.....	
1,350	135,000	.00571	.00034	.....	.....	
1,400	140,000	.00605	.00034	.....	.....	Elastic limit.
1,450	145,000	.00642	.00037	.....	.....	
1,500	150,000	.00685	.00043	.....	.....	
1,550	155,000	.00735	.00050	.....	.....	
1,600	160,000	.00820	.00085	.....	.....	
1,650	165,000	.00941	.00121	.....	.....	
1,700	170,000	.01325	.00384	.....	.....	Tensile strength.
1,748	174,800	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,800  
 Elastic limit per square inch of original section..... do... 145,000  
 Elongation per inch after rupture ..... inch... .021  
 Elongation per inch under strain at elastic limit..... do... .00642  
 Reduction in area after rupture, per centum of original section..... 42.0  
 Position of rupture..... 3".1 inside the gauged section  
 Character of broken surface..... fine silky

No. 4106.

Marks, No. 445.

Sectional area,  $''0936 \times ''0983 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
48	5,000	0.	0.	0.	0.	
194	20,000	.00078	.00078	.....	.....	
388	40,000	.00158	.00080	.....	.....	
582	60,000	.00265	.00107	.....	.....	
776	80,000	.00325	.00060	.....	.....	
970	100,000	.00425	.00100	.....	.....	
1,164	120,000	.00508	.00083	.....	.....	
1,212	125,000	.00530	.00022	.....	.....	
1,261	130,000	.00552	.00022	.....	.....	
1,309	135,000	.00592	.00040	.....	.....	Elastic limit.
1,358	140,000	.00630	.00038	.....	.....	
1,406	145,000	.00668	.00038	.....	.....	
1,455	150,000	.00735	.00067	.....	.....	
1,503	155,000	.00807	.00072	.....	.....	
1,552	160,000	.01050	.00243	.....	.....	
1,600	165,000	.01395	.00345	.....	.....	
1,649	170,000	.023	.00905	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 170,000  
 Elastic limit per square inch of original section ..... do .. 145,000  
 Elongation per inch after rupture ..... inch.. .023  
 Elongation per inch under strain at elastic limit ..... do... .00668  
 Reduction in area after rupture, per centum of original section ..... 39.2  
 Position of rupture ..... 3/4 9 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4107.

Marks, No. 450.

Sectional area,  $''0984 \times ''0986 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00077	.00077	.....	.....	
388	40,000	.00150	.00073	.....	.....	
582	60,000	.00227	.00077	.....	.....	
776	80,000	.00322	.00095	.....	.....	
970	100,000	.00410	.00088	.....	.....	Elastic limit.
1,164	120,000	.00530	.00120	.....	.....	
1,212	125,000	.00557	.00027	.....	.....	
1,261	130,000	.00587	.00030	.....	.....	
1,309	135,000	.00632	.00045	.....	.....	
1,358	140,000	.00672	.00040	.....	.....	
1,406	145,000	.00740	.00068	.....	.....	
1,455	150,000	.00880	.00140	.....	.....	
1,503	155,000	.01040	.00160	.....	.....	
1,552	160,000	.015	.00460	.....	.....	
1,596	164,540	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 164,540  
 Elastic limit per square inch of original section..... do... 130,000  
 Elongation per inch after rupture..... inch... 0.010  
 Elongation per inch under strain at elastic limit..... do... .00587  
 Reduction in area after rupture, per centum of original section..... 39.2  
 Position of rupture..... 1''.8 outside the gauged section  
 Character of broken surface..... fine silky

No. 4108.

Marks, No. 455.

Sectional area,  $''\cdot1002 \times ''\cdot1000 = .010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.			Initial load.
200	20,000	.00080	.00080			
400	40,000	.00160	.00080			
600	60,000	.00242	.00082			
800	80,000	.00318	.00076			
1,000	100,000	.00403	.00085			
1,200	120,000	.00492	.00089			
1,250	125,000	.00508	.00016			
1,300	130,000	.00537	.00029			
1,350	135,000	.00562	.00025			
1,400	140,000	.00592	.00030			Elastic limit.
1,450	145,000	.00622	.00030			
1,500	150,000	.00660	.00038			
1,550	155,000	.00700	.00040			
1,600	160,000	.00750	.00050			
1,650	165,000	.00817	.00067			
1,700	170,000	.00920	.00103			
1,750	175,000	.01168	.00248			
1,800	180,000	.020	.00832			
1,833	183,300					Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds... 183,300  
 Elastic limit per square inch of original section .....do... 155,000  
 Elongation per inch after rupture.....inch... .021  
 Elongation per inch under strain at elastic limit.....do... .00700  
 Reduction in area after rupture, per centum of original section.....28.0  
 Position of rupture.....4''.9 inside the gauged section  
 Character of broken surface.....fine silky

No. 4109.

Marks, No. 460.

Sectional area,  $".1002 \times ".0998 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00080	.00080	.....	.....	
400	40,000	.00142	.00062	.....	.....	
600	60,000	.00230	.00088	.....	.....	
800	80,000	.00303	.00073	.....	.....	
1,000	100,000	.00388	.00085	.....	.....	
1,200	120,000	.00467	.00079	.....	.....	
1,250	125,000	.00485	.00018	.....	.....	
1,300	130,000	.00517	.00032	.....	.....	
1,350	135,000	.00538	.00021	.....	.....	Elastic limit.
1,400	140,000	.00567	.00029	.....	.....	
1,450	145,000	.00600	.00043	.....	.....	
1,500	150,000	.00635	.00035	.....	.....	
1,550	155,000	.00680	.00045	.....	.....	
1,600	160,000	.00740	.00060	.....	.....	
1,650	165,000	.00840	.00100	.....	.....	
1,700	170,000	.01070	.00230	.....	.....	
1,750	175,000	.022	.01130	.....	.....	
1,788	178,800	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds .. 178,800  
 Elastic limit per square inch of original section ..... do .. 150,000  
 Elongation per inch after rupture ..... Inch .. .028  
 Elongation per inch under strain at elastic limit ..... do .. .00515  
 Reduction in area after rupture, per centum of original section ..... 39.0  
 Position of rupture ..... 3". 75 inside the gauged section  
 Character of broken surface ..... Fine silky

No. 4110.

Marks, No. 465.

Sectional area,  $".1003 \times ".1005 = .0101$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5, 000	0.	0.	0.	0.	Initial load.
202	20, 000	.00087	.00087	.....	.....	
404	40, 000	.00158	.00071	.....	.....	
606	60, 000	.00228	.00070	.....	.....	
808	80, 000	.00314	.00086	.....	.....	
1, 010	100, 000	.00410	.00096	.....	.....	
1, 212	120, 000	.00518	.00108	.....	.....	
1, 262	125, 000	.00537	.00019	.....	.....	
1, 313	130, 000	.00560	.00023	.....	.....	Elastic limit.
1, 363	135, 000	.00603	.00043	.....	.....	
1, 414	140, 000	.00652	.00049	.....	.....	
1, 464	145, 000	.00692	.00040	.....	.....	
1, 515	150, 000	.00743	.00051	.....	.....	
1, 565	155, 000	.00822	.00079	.....	.....	
1, 616	160, 000	.00960	.00138	.....	.....	
1, 656	165, 000	.01275	.00315	.....	.....	
1, 710	169, 310	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 169,310  
 Elastic limit per square inch of original section ..... do .. 130,000  
 Elongation per inch after rupture ..... inch.. .011  
 Elongation per inch under strain at elastic limit. .... do... .00560  
 Reduction in area after rupture, per centum of original section ..... 39.6  
 Position of rupture ..... 4".15 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4111.

Marks, No. 470.

Sectional area,  $'' .1003 \times '' .1001 = .010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00072	.00072	.....	.....	
400	40,000	.00152	.00080	.....	.....	
600	60,000	.00228	.00076	.....	.....	
800	80,000	.00318	.00090	.....	.....	
1,000	100,000	.00412	.00094	.....	.....	
1,200	120,000	.00500	.00088	.....	.....	
1,250	125,000	.00520	.00020	.....	.....	
1,300	130,000	.00548	.00028	.....	.....	Elastic limit.
1,350	135,000	.00590	.00042	.....	.....	
1,400	140,000	.00632	.00042	.....	.....	
1,450	145,000	.00680	.00048	.....	.....	
1,500	150,000	.00758	.00078	.....	.....	
1,550	155,000	.00883	.00125	.....	.....	
1,600	160,000	.01350	.00467	.....	.....	
1,650	165,000	.024	.01050	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds ..	165,000
Elastic limit per square inch of original section .....	do. ....	130,000
Elongation per inch after rupture .....	inch .....	.016
Elongation per inch under strain at elastic limit .....	do. ....	.00548
Reduction in area after rupture, per centum of original section .....		39.0
Position of rupture .....	2'' .1 outside the gauged section	
Character of broken surface .....	fine silky	



No. 4112.

Marks, No. 475.

Sectional area,  $".1001 \times ".0999 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0	0.	Initial load.
200	20,000	.00070	.00070	.....	.....	
400	40,000	.00152	.00082	.....	.....	
600	60,000	.00222	.00080	.....	.....	
800	80,000	.00320	.00088	.....	.....	
1,000	100,000	.00403	.00083	.....	.....	
1,200	120,000	.00520	.00117	.....	.....	
1,250	125,000	.00540	.00020	.....	.....	
1,300	130,000	.00570	.00050	.....	.....	
1,350	135,000	.00608	.00038	.....	.....	
1,400	140,000	.00647	.00039	.....	.....	Elastic limit.
1,450	145,000	.00693	.00046	.....	.....	
1,500	150,000	.00755	.00062	.....	.....	
1,550	155,000	.00843	.00088	.....	.....	
1,600	160,000	.01010	.00167	.....	.....	
1,650	165,000	.01485	.00475	.....	.....	Tensile strength.
1,689	168,900	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 168,900  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .021  
 Elongation per inch under strain at elastic limit ..... do... .00647  
 Reduction in area after rupture, per centum of original section ..... 31.0  
 Position of rupture ..... 4" inside the gauged section  
 Character of broken surface ..... fine silky

No. 4113.

Marks, No. 480.

Sectional area,  $''\text{.0999} \times ''\text{.0996} = .010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00078	.00078	.....	.....	
400	40,000	.00153	.00075	.....	.....	
600	60,000	.00233	.00080	.....	.....	
800	80,000	.00318	.00085	.....	.....	
1,000	100,000	.00398	.00080	.....	.....	
1,200	120,000	.00498	.00100	.....	.....	
1,250	125,000	.00527	.00029	.....	.....	
1,300	130,000	.00550	.00023	.....	.....	
1,350	135,000	.00587	.00037	.....	.....	
1,400	140,000	.00613	.00026	.....	.....	Elastic limit.
1,450	145,000	.00655	.00042	.....	.....	
1,500	150,000	.00695	.00040	.....	.....	
1,550	155,000	.00738	.00043	.....	.....	
1,600	160,000	.00810	.00072	.....	.....	
1,650	165,000	.00950	.00140	.....	.....	Tensile strength.
1,700	170,000	.01350	.00400	.....	.....	
1,742	174,200	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 174,200  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... 0.21  
 Elongation per inch under strain at elastic limit.....do... .00613  
 Reduction in area after rupture, per centum of original section.....34.0  
 Position of rupture.....3''.6 inside the gauged section  
 Character of broken surface.....fine silky

No. 4114.

Marks No. 485.

Sectional area,  $''0994 \times ''0989 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	.0	.0	0.	0.	Initial load.
196	20,000	.00072	.00072	.....	.....	
392	40,000	.00148	.00076	.....	.....	
588	60,000	.00227	.00079	.....	.....	
784	80,000	.00302	.00075	.....	.....	
980	100,000	.00382	.00080	.....	.....	
1,176	120,000	.00432	.00100	.....	.....	
1,225	125,000	.00505	.00023	.....	.....	
1,274	130,000	.00528	.00023	.....	.....	
1,323	135,000	.00562	.00040	.....	.....	
1,372	140,000	.00600	.00032	.....	.....	Elastic limit.
1,421	145,000	.00635	.00035	.....	.....	
1,470	150,000	.00683	.00048	.....	.....	
1,519	155,000	.00768	.00085	.....	.....	
1,568	160,000	.00885	.00127	.....	.....	
1,617	165,000	.01293	.00398	.....	.....	Tensile strength.
1,666	170,000	.023	.01007	.....	.....	
1,702	173,670	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 173,670  
 Elastic limit per square inch of original section.....do... 145,300  
 Elongation per inch after rupture .....inch... .021  
 Elongation per inch under strain at elastic limit .....do... .00635  
 Reduction in area after rupture, per centum of original section ..... 39.8  
 Position of rupture .....3''.7 outside the gauged section  
 Character of broken surface .....fine silky

No. 4115.

Marks, No. 490.

Sectional area,  $''\cdot0993 \times \cdot0997 = \cdot0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00077	.00077	.....	.....	
396	40,000	.00162	.00085	.....	.....	
594	60,000	.00247	.00085	.....	.....	
792	80,000	.00332	.00085	.....	.....	
1,188	120,000	.00530	.00098	.....	.....	Elastic limit.
1,237	125,000	.00550	.00020	.....	.....	
1,287	130,000	.00578	.00028	.....	.....	
1,336	135,000	.00618	.00040	.....	.....	
1,386	140,000	.00660	.00042	.....	.....	
1,436	145,000	.00717	.00057	.....	.....	
1,485	150,000	.00767	.00050	.....	.....	
1,535	155,000	.00825	.00058	.....	.....	
1,584	160,000	.00937	.00112	.....	.....	
1,634	165,000	.01130	.00193	.....	.....	
1,683	170,000	.01425	.00295	.....	.....	Tensile strength.
1,730	174,750	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section..... pounds.. 174,750  
 Elastic limit per square inch of original section..... do .. 135,000  
 Elongation per inch after rupture..... inch.. .020  
 Elongation per inch under strain at elastic limit..... do... .00618  
 Reduction in area after rupture, per centum of original section..... 40.4  
 Position of rupture ..... 3''.55 inside the gauged section  
 Character of broken surface..... fine silky

## No. 4116.

Marks, No. 495.

Sectional area,  $".1000 \times ".1000 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0	0.	0.	
200	20,000	.00076	.00076	.....	.....	
400	40,000	.00155	.00079	.....	.....	
600	60,000	.00248	.00083	.....	.....	
800	80,000	.00328	.00080	.....	.....	Elastic limit.
1,000	100,000	.00450	.00122	.....	.....	
1,200	120,000	.00567	.00117	.....	.....	
1,250	125,000	.00585	.00018	.....	.....	
1,300	130,000	.00620	.00035	.....	.....	
1,350	135,000	.00662	.00042	.....	.....	
1,400	140,000	.00715	.00053	.....	.....	
1,450	145,000	.00785	.00070	.....	.....	
1,500	150,000	.00890	.00105	.....	.....	
1,550	155,000	.01075	.00185	.....	.....	
1,600	160,000	.01507	.00432	.....	.....	Tensile strength.
1,641	164,100	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 164,100  
 Elastic limit per square inch of original section.....do.... 135,000  
 Elongation per inch after rupture.....inch..... .014  
 Elongation per inch under strain at elastic limit.....do..... .00662  
 Reduction in area after rupture, per centum of original section.....39.0  
 Position of rupture.....1".2 outside the gauged section  
 Character of broken surface.....fine silky

No. 4117.

Marks, No. 500.

Sectional area,  $''\text{.0997} \times ''\text{.0997} = \text{.0099}$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00073	.00073	.....	.....	
396	40,000	.00159	.00086	.....	.....	
594	60,000	.00234	.00075	.....	.....	
792	80,000	.00322	.00088	.....	.....	
990	100,000	.00408	.00086	.....	.....	
1,188	120,000	.00502	.00094	.....	.....	
1,237	125,000	.00527	.00025	.....	.....	
1,287	130,000	.00550	.00023	.....	.....	
1,336	135,000	.00578	.00028	.....	.....	
1,386	140,000	.00608	.00030	.....	.....	Elastic limit.
1,436	145,000	.00642	.00034	.....	.....	
1,485	150,000	.00682	.00040	.....	.....	
1,535	155,000	.00738	.00056	.....	.....	
1,584	160,000	.00808	.00070	.....	.....	
1,634	165,000	.00910	.00102	.....	.....	
1,683	170,000	.01110	.00200	.....	.....	
1,733	175,060	.018	.0069	.....	.....	
1,763	178,080	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 178,080  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .023  
 Elongation per inch under strain at elastic limit ..... do... .00642  
 Reduction in area after rupture, per centum of original section ..... 41.4  
 Position of rupture ..... 4'' inside the gauged section  
 Character of broken surface ..... fine silky

No. 4118.

Marks, No. 505.

Sectional area,  $''\cdot0996 \times ''\cdot1000 = .010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00079	.00079	.....	.....	
400	40,000	.00162	.00083	.....	.....	
600	60,000	.00239	.00077	.....	.....	
800	80,000	.00315	.00076	.....	.....	
1,000	100,000	.00415	.00100	.....	.....	
1,200	120,000	.00502	.00087	.....	.....	
1,250	125,000	.00527	.00025	.....	.....	
1,300	130,000	.00550	.00023	.....	.....	
1,350	135,000	.00577	.00027	.....	.....	
1,400	140,000	.00609	.00032	.....	.....	Elastic limit.
1,450	145,000	.00642	.00033	.....	.....	
1,500	150,000	.00683	.00041	.....	.....	
1,550	155,000	.00727	.00044	.....	.....	
1,600	160,000	.00787	.00080	.....	.....	
1,650	165,000	.00886	.00179	.....	.....	
1,700	170,000	.01017	.00151	.....	.....	
1,750	175,000	.014	.00383	.....	.....	
1,800	180,000	.020	.006	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 180,000  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture..... inch... .011  
 Elongation per inch under strain at elastic limit..... do... .00642  
 Reduction in area after rupture, per centum of original section..... 41.0  
 Position of rupture..... 3'', 4 outside the gauged section  
 Character of broken surface..... fine silky

No. 4119.

Marks, No. 510.

Sectional area,  $".1000 \times ".1000 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00075	.00075	.....	.....	
400	40,000	.00150	.00075	.....	.....	
600	60,000	.00224	.00074	.....	.....	
800	80,000	.00322	.00098	.....	.....	
1,000	100,000	.00397	.00075	.....	.....	
1,200	120,000	.00495	.00098	.....	.....	
1,250	125,000	.00525	.00030	.....	.....	
1,300	130,000	.00545	.00020	.....	.....	
1,350	135,000	.00564	.00019	.....	.....	
1,400	140,000	.00590	.00026	.....	.....	Elastic limit.
1,450	145,000	.00622	.00032	.....	.....	
1,500	150,000	.00665	.00043	.....	.....	
1,550	155,000	.00720	.00055	.....	.....	
1,600	160,000	.00791	.00071	.....	.....	
1,650	165,000	.00950	.00159	.....	.....	
1,700	170,000	.015	.00550	.....	.....	
1,750	175,000	.024	.009	.....	.....	
1,784	178,400	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 178,400  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .031  
 Elongation per inch under strain at elastic limit ..... do... .00622  
 Reduction in area after rupture, per centum of original section ..... 42.0  
 Position of rupture ..... 2" inside the gauged section  
 Character of broken surface ..... fine silky



No. 4120.

Marks, No. 515.

Sectional area,  $''0982 \times ''0986 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00077	.00077	.....	.....	
388	40,000	.00152	.00075	.....	.....	
582	60,000	.00237	.00085	.....	.....	
776	80,000	.00322	.00085	.....	.....	
970	100,000	.00412	.00090	.....	.....	
1,164	120,000	.00515	.00103	.....	.....	
1,212	125,000	.00535	.00020	.....	.....	
1,261	130,000	.00564	.00029	.....	.....	
1,309	135,000	.00608	.00014	.....	.....	
1,358	140,000	.00630	.00022	.....	.....	Elastic limit.
1,406	145,000	.00677	.00047	.....	.....	
1,455	150,000	.00719	.00042	.....	.....	
1,503	155,000	.00787	.00068	.....	.....	
1,552	160,000	.00853	.00066	.....	.....	
1,600	165,000	.00986	.00133	.....	.....	
1,649	170,000	.01190	.00204	.....	.....	
1,697	175,000	.018	.0061	.....	.....	
1,746	180,000	.028	.010	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 180,000  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do... .00719  
 Reduction in area after rupture, per centum of original section ..... 37.1  
 Position of rupture ..... 2'' 3 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4121.

Marks, No. 520.

Sectional area,  $''\text{.0996} \times ''\text{.1000} = .010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00075	.00075	.....	.....	
400	40,000	.00158	.00083	.....	.....	
600	60,000	.00238	.00080	.....	.....	
800	80,000	.00322	.00084	.....	.....	
1,000	100,000	.00392	.00070	.....	.....	
1,200	120,000	.00481	.00089	.....	.....	
1,250	125,000	.00501	.00020	.....	.....	
1,300	130,000	.00531	.00030	.....	.....	
1,350	135,000	.00557	.00026	.....	.....	
1,400	140,000	.00592	.00035	.....	.....	Elastic limit.
1,450	145,000	.00627	.00035	.....	.....	
1,500	150,000	.00666	.00033	.....	.....	
1,550	155,000	.00705	.00045	.....	.....	
1,600	160,000	.00778	.00073	.....	.....	
1,650	165,000	.00878	.00100	.....	.....	Tensile strength.
1,700	170,000	.01170	.00292	.....	.....	
1,750	175,000	.022	.0103	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 175,000  
 Elastic limit per square inch of original section.....do... 150,000  
 Elongation per inch after rupture.....inch.. .013  
 Elongation per inch under strain at elastic limit.....do... .00660  
 Reduction in area after rupture, per centum of original section.....41.0  
 Position of rupture.....4".3 outside the gauged section  
 Character of broken surface.....fine silky

No. 4129.

Marks, No. 525.

Sectional area,  $''0986 \times ''0989 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00073	.00073	.....	.....	
392	40,000	.00168	.00095	.....	.....	
588	60,000	.00250	.00082	.....	.....	
784	80,000	.00311	.00061	.....	.....	
980	100,000	.00422	.00111	.....	.....	
1,176	120,000	.00500	.00078	.....	.....	
1,225	125,000	.00530	.00030	.....	.....	
1,274	130,000	.00552	.00022	.....	.....	
1,323	135,000	.00578	.00026	.....	.....	
1,372	140,000	.00617	.00039	.....	.....	Elastic limit.
1,421	145,000	.00682	.00065	.....	.....	
1,470	150,000	.00727	.00045	.....	.....	
1,519	155,000	.00838	.00111	.....	.....	
1,568	160,000	.00970	.00132	.....	.....	
1,617	165,000	.01235	.00265	.....	.....	Tensile strength.
1,651	168,470	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 168,470  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .007  
 Elongation per inch under strain at elastic limit ..... do... .00617  
 Reduction in area after rupture, per centum of original section ..... 37.8  
 Position of rupture ..... 5''.2 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4130.

Marks No. 535.

Sectional area,  $''\text{.0998} \times ''\text{.0993} = \text{.0099 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00075	.00075	.....	.....	
800	40,000	.00165	.00090	.....	.....	
594	60,000	.00245	.00080	.....	.....	
792	80,000	.00312	.00067	.....	.....	
990	100,000	.00407	.00095	.....	.....	
1,188	120,000	.00485	.00078	.....	.....	
1,237	125,000	.00495	.00010	.....	.....	
1,287	130,000	.00512	.00017	.....	.....	
1,336	135,000	.00547	.00035	.....	.....	
1,386	140,000	.00575	.00028	.....	.....	Elastic limit.
1,436	145,000	.00597	.00022	.....	.....	
1,485	150,000	.00639	.00042	.....	.....	
1,535	155,000	.00669	.00030	.....	.....	
1,584	160,000	.00737	.00068	.....	.....	
1,634	165,000	.00842	.00105	.....	.....	
1,683	170,000	.00922	.00080	.....	.....	Tensile strength.
1,730	174,750	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,750  
 Elastic limit per square inch of original section ..... do.... 155,000  
 Elongation per inch after rupture ..... inhc.. .022  
 Elongation per inch under strain at elastic limit ..... do.... .00669  
 Reduction in area after rupture, per centum of original section ..... 43.4  
 Position of rupture ..... 3''.8 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4131.

Marks, No. 540.

Sectional area,  $''0984 \times ''0983 = .0097$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00079	.00076	.....	.....	
388	40,000	.00169	.00093	.....	.....	
582	60,000	.00247	.00078	.....	.....	
776	80,000	.00328	.00081	.....	.....	
970	100,000	.00422	.00094	.....	.....	
1,164	120,000	.00485	.00083	.....	.....	
1,212	125,000	.00516	.00031	.....	.....	
1,261	130,000	.00540	.00024	.....	.....	
1,309	135,000	.00566	.00026	.....	.....	
1,358	140,000	.00590	.00024	.....	.....	Elastic limit.
1,406	145,000	.00620	.00030	.....	.....	
1,455	150,000	.00662	.00042	.....	.....	
1,503	155,000	.00680	.00018	.....	.....	
1,552	160,000	.00738	.00058	.....	.....	
1,600	165,000	.00782	.00044	.....	.....	
1,649	170,000	.00840	.00058	.....	.....	
1,697	175,000	.00938	.00098	.....	.....	
1,746	180,000	.013	.00362	.....	.....	
1,794	185,000	.019	.006	.....	.....	Tensile strength.
1,836	189,280	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 189,280  
 Elastic limit per square inch of original section ..... do.. 155,000  
 Elongation per inch after rupture ..... inch.. .016  
 Elongation per inch under strain at elastic limit ..... do.. .00680  
 Reduction in area after rupture, per centum of original section ..... 32.0  
 Position of rupture ..... 3''.7 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4132.

Marks, No. 545.

Sectional area,  $''\text{.0990} \times ''\text{.0991} = \text{.0098 square inch.}$ 

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00081	.00081	.....	.....	
392	40,000	.00169	.00088	.....	.....	
588	60,000	.00262	.00093	.....	.....	
784	80,000	.00345	.00083	.....	.....	
980	100,000	.00430	.00085	.....	.....	Elastic limit.
1,176	120,000	.00526	.00096	.....	.....	
1,225	125,000	.00645	.00019	.....	.....	
1,274	130,000	.00570	.00025	.....	.....	
1,323	135,000	.00605	.00035	.....	.....	
1,372	140,000	.00642	.00037	.....	.....	
1,421	145,000	.00688	.00046	.....	.....	
1,470	150,000	.00748	.00060	.....	.....	
1,519	155,000	.00845	.00097	.....	.....	
1,568	160,000	.01050	.00205	.....	.....	
1,617	165,000	.017	.00650	.....	.....	Tensile strength.
1,660	169,390	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 169,390  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... .021  
 Elongation per inch under strain at elastic limit.....do... .00642  
 Reduction in area after rupture, per centum of original section.....39.8  
 Position of rupture.....''5 outside the gauged section  
 Character of broken surface.....fine silky

No. 4133.

Marks, No. 550.

Sectional area,  $''\cdot0985 \times ''\cdot0988 = \cdot0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
195	20,000	.00081	.00081	.....	.....	
392	40,000	.00167	.00086	.....	.....	
588	60,000	.00260	.00093	.....	.....	
784	80,000	.00345	.00085	.....	.....	
980	100,000	.00453	.00108	.....	.....	Elastic limit.
1,176	120,000	.00568	.00115	.....	.....	
1,225	125,000	.00590	.00022	.....	.....	
1,274	130,000	.00631	.00041	.....	.....	
1,323	135,000	.00683	.00052	.....	.....	
1,372	140,000	.00740	.00057	.....	.....	
1,421	145,000	.00811	.00071	.....	.....	
1,470	150,000	.00925	.00114	.....	.....	
1,519	155,000	.01118	.00193	.....	.....	
1,568	160,000	.014	.00282	.....	.....	
1,617	165,000	.022	.008	.....	.....	Tensile strength.
1,638	167,140	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 167,140  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch... .021  
 Elongation per inch under strain at elastic limit.....do... .00631  
 Reduction in area after rupture, per centum of original section..... 46.9  
 Position of rupture.....4".3 inside the gauged section  
 Character of broken surface.....fine silky

No. 4134.

Marks, No. 555.

Sectional area,  $''0994 \times ''0995 = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00079	.00079	.....	.....	
396	40,000	.00158	.00079	.....	.....	
594	60,000	.00241	.00083	.....	.....	
792	80,000	.00335	.00094	.....	.....	
990	100,000	.00428	.00093	.....	.....	Elastic limit.
1,188	120,000	.00535	.00107	.....	.....	
1,237	125,000	.00562	.00027	.....	.....	
1,287	130,000	.00608	.00046	.....	.....	
1,336	135,000	.00660	.00052	.....	.....	
1,386	140,000	.00713	.00053	.....	.....	
1,436	145,000	.00820	.00107	.....	.....	
1,485	150,000	.00922	.00102	.....	.....	
1,535	155,000	.01190	.00268	.....	.....	
1,584	160,000	.020	.0081	.....	.....	
1,618	163,430	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section..... pounds.. 163,430  
 Elastic limit per square inch of original section..... do... 125,000  
 Elongation per inch after rupture..... inch... .027  
 Elongation per inch under strain at elastic limit..... do... .00562  
 Reduction in area after rupture, per centum of original section..... 40.4  
 Position of rupture..... 4''.3 inside the gauged section  
 Character of broken surface..... fine silky



No. 4135.

Marks, No. 560.

Sectional area,  $".0986 \times ".0991 = .0097$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00083	.00083	.....	.....	
388	40,000	.00165	.00082	.....	.....	
582	60,000	.00248	.00083	.....	.....	
776	80,000	.00327	.00079	.....	.....	
970	100,000	.00432	.00105	.....	.....	Elastic limit.
1,164	120,000	.00556	.00122	.....	.....	
1,212	125,000	.00573	.00017	.....	.....	
1,261	130,000	.00620	.00047	.....	.....	
1,309	135,000	.00677	.00057	.....	.....	
1,358	140,000	.00721	.00044	.....	.....	
1,406	145,000	.00807	.00086	.....	.....	
1,455	150,000	.00895	.00088	.....	.....	
1,503	155,000	.01057	.00162	.....	.....	
1,552	160,000	.014	.00343	.....	.....	
1,600	165,000	.022	.008	.....	.....	Tensile strength.
1,602	165,150	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 165,150  
 Elastic limit per square inch of original section.....do... 125,000  
 Elongation per inch after rupture.....inch... .020  
 Elongation per inch under strain at elastic limit .....do... .00573  
 Reduction in area after rupture, per centum of original section..... 40.2  
 Position of rupture .....".9 inside the gauged section  
 Character of broken surface.....fine silky

No. 4136.

Marks, No. 565.

Sectional area,  $".0989 \times ".0996 = ".0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00080	.00080	.....	.....	
392	40,000	.00177	.00097	.....	.....	
588	60,000	.00260	.00083	.....	.....	
784	80,000	.00350	.00090	.....	.....	
980	100,000	.00458	.00108	.....	.....	
1,176	120,000	.00585	.00127	.....	.....	Elastic limit.
1,225	125,000	.00605	.00020	.....	.....	
1,274	130,000	.00642	.00037	.....	.....	
1,323	135,000	.00698	.00056	.....	.....	
1,372	140,000	.00768	.00070	.....	.....	
1,421	145,000	.00830	.00062	.....	.....	
1,470	150,000	.00945	.00115	.....	.....	Tensile strength.
1,519	155,000	.01200	.00255	.....	.....	
1,568	160,000	.017	.005	.....	.....	
1,606	163,880	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 163,880  
 Elastic limit per square inch of original section ..... do... 130,000  
 Elongation per inch after rupture ..... inch.. .022  
 Elongation per inch under strain at elastic limit ..... do... .00642  
 Reduction in area after rupture, per centum of original section ..... 39.8  
 Position of rupture ..... 1".4 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4137.

Marks, No. 570.

Sectional area,  $''\text{.0997} \times ''\text{.0996} = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
108	20,000	.00079	.00079	.....	.....	
396	40,000	.00170	.00091	.....	.....	
594	60,000	.00242	.00072	.....	.....	
792	80,000	.00332	.00110	.....	.....	
990	100,000	.00422	.00090	.....	.....	
1,188	120,000	.00522	.00100	.....	.....	
1,237	125,000	.00550	.00028	.....	.....	
1,287	130,000	.00568	.00018	.....	.....	
1,336	135,000	.00610	.00042	.....	.....	
1,386	140,000	.00640	.00030	.....	.....	Elastic limit.
1,436	145,000	.00677	.00037	.....	.....	
1,485	150,000	.00728	.00051	.....	.....	
1,535	155,000	.00778	.00050	.....	.....	
1,584	160,000	.00845	.00067	.....	.....	
1,634	165,000	.010	.00155	.....	.....	
1,683	170,000	.014	.004	.....	.....	Tensile strength.
1,736	175,300	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 175,350  
 Elastic limit per square inch of original section ..... do... 145,000  
 Elongation per inch after rupture ..... inch... .010  
 Elongation per inch under strain at elastic limit ..... do... .00677  
 Reduction in area after rupture, per centum of original section ..... 32.3  
 Position of rupture ..... 4''.7 outside the gauged section  
 Character of broken surface ..... fine silky

No. 4138.

Marks, No. 575.

Sectional area,  $''\cdot0101 \times ''\cdot0100 = \cdot010$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00080	.00080	.....	.....	
400	40,000	.00155	.00075	.....	.....	
600	60,000	.00225	.00070	.....	.....	
800	80,000	.00300	.00075	.....	.....	
1,000	100,000	.00390	.00090	.....	.....	
1,200	120,000	.00465	.00075	.....	.....	
1,250	125,000	.00488	.00023	.....	.....	
1,300	130,000	.00507	.00019	.....	.....	
1,350	135,000	.00524	.00017	.....	.....	Elastic limit.
1,400	140,000	.00541	.00017	.....	.....	
1,450	145,000	.00570	.00029	.....	.....	
1,500	150,000	.00600	.00030	.....	.....	
1,550	155,000	.00628	.00028	.....	.....	
1,600	160,000	.00667	.00039	.....	.....	
1,650	165,000	.00710	.00043	.....	.....	
1,700	170,000	.00771	.00061	.....	.....	
1,750	175,000	.00870	.00099	.....	.....	
1,800	180,000	.01260	.00390	.....	.....	
1,850	185,000	.020	.00740	.....	.....	Tensile strength.
1,877	187,700	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds .. 187,700  
 Elastic limit per square inch of original section ..... do. .. 160,000  
 Elongation per inch after rupture ..... inch. . . . .023  
 Elongation per inch under strain at elastic limit ..... do. . . . .00667  
 Reduction in area after rupture, per centum of original section ..... 31.0  
 Position of rupture ..... 2''·3 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4139.

Marks, No. 580.

Sectional area,  $''\text{.0990} \times ''\text{.0991} = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00077	.00077	.....	.....	
392	40,000	.00170	.00093	.....	.....	
588	60,000	.00233	.00063	.....	.....	
784	80,000	.00315	.00082	.....	.....	
980	100,000	.00405	.00090	.....	.....	
1,176	120,000	.00480	.00075	.....	.....	
1,225	125,000	.00500	.00020	.....	.....	
1,274	130,000	.00522	.00022	.....	.....	
1,323	135,000	.00539	.00017	.....	.....	
1,372	140,000	.00567	.00028	.....	.....	
1,421	145,000	.00587	.00020	.....	.....	
1,470	150,000	.00626	.00039	.....	.....	Elastic limit.
1,519	155,000	.00681	.00055	.....	.....	
1,568	160,000	.00720	.00039	.....	.....	
1,617	165,000	.00780	.00060	.....	.....	
1,666	170,000	.00887	.00107	.....	.....	
1,715	175,000	.01130	.00243	.....	.....	
1,764	180,000	.021	.0097	.....	.....	
1,792	182,860	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 182,860  
 Elastic limit per square inch of original section ..... do... 150,000  
 Elongation per inch after rupture ..... inch... .022  
 Elongation per inch under strain at elastic limit ..... do... .00626  
 Reduction in area after rupture, per centum of original section ..... 37.8  
 Position of rupture ..... 1''.9 inside the gauged section  
 Character of broken surface ..... fine silky

No. 4140.

Marks, No. 585.

Sectional area,  $''\text{.0996} \times ''\text{.0996} = .0099$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00078	.00078	.....	.....	
396	40,000	.00162	.00284	.....	.....	
594	60,000	.00240	.00078	.....	.....	
792	80,000	.00317	.00077	.....	.....	
990	100,000	.00407	.00090	.....	.....	
1,188	120,000	.00495	.00088	.....	.....	
1,237	125,000	.00512	.00017	.....	.....	
1,287	130,000	.00531	.00019	.....	.....	
1,336	135,000	.00571	.00040	.....	.....	
1,386	140,000	.00607	.00036	.....	.....	Elastic limit.
1,436	145,000	.00641	.00034	.....	.....	
1,485	150,000	.00691	.00050	.....	.....	
1,535	155,000	.00775	.00084	.....	.....	
1,584	160,000	.00910	.00135	.....	.....	
1,634	165,000	.020	.0109	.....	.....	
1,683	170,000	.028	.008	.....	.....	Tensile strength.
1,704	172,120	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 172,120  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .018  
 Elongation per inch under strain at elastic limit.....do... .00641  
 Reduction in area after rupture, per centum of original section.....41.4  
 Position of rupture.....4'' 7 outside the gauged section  
 Character of broken surface.....fine silky

## No. 4141.

Marks, 590.

Sectional area,  $".0993 \times ".0995 = .0099$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Persquare inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00077	.00077	.....	.....	
396	40,000	.00167	.00090	.....	.....	
594	60,000	.00236	.00069	.....	.....	
792	80,000	.00330	.00094	.....	.....	
990	100,000	.00425	.00095	.....	.....	
1,188	120,000	.00507	.00082	.....	.....	
1,237	125,000	.00527	.00020	.....	.....	
1,287	130,000	.00547	.00020	.....	.....	
1,336	135,000	.00580	.00033	.....	.....	Elastic limit.
1,386	140,000	.00610	.00030	.....	.....	
1,436	145,000	.00658	.00048	.....	.....	
1,485	150,000	.00706	.00048	.....	.....	
1,535	155,000	.00778	.00072	.....	.....	
1,584	160,000	.00925	.00147	.....	.....	
1,634	165,000	.014	.00475	.....	.....	
1,683	170,000	.024	.010	.....	.....	
1,690	170,710	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 170,710  
 Elastic limit per square inch of original section.....do... 140,000  
 Elongation per inch after rupture.....inch... .017  
 Elongation per inch under strain at elastic limit.....do... .00610  
 Reduction in area after rupture, per centum of original section..... 38.4  
 Position of rupture.....".8 outside the gauged section  
 Character of broken surface.....fine silky.

H. Ex. 165—37

TABULATION OF ROUND STEEL RODS BEFORE DRAWING, SQUARE STEEL WIRE AT DIFFERENT STAGES OF DRAWING,  
AND 1-INCH SQUARE FINISHED TINNED STEEL WIRE.

[From J. A. Roebling's Sons Company.]

No. of test.	Mark on spec-imen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.	Area at fracture.	Con- traction of area.	Appearance of fracture.	Remarks.
		Width.	Thick-ness.		Total.	Per sq. inch.	Total.	Per sq. inch.					
		<i>Inch.</i>	<i>Inch.</i>	<i>Sq. Inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>In.</i>	<i>" Sq. in.</i>	<i>Per ct.</i>		
3837	1	.216	Diam.	.086	2,016	56,000	3,734	103,720	.96	Diam. .17	0.023	Fine, silky.	Samples from ends of coiled rods before drawing.
3838	2	.220	Diam.	.098	2,280	60,000	3,890	102,380	1.20	Diam. .16	0.020	do.	
3839	3	.212	Diam.	.085	1,890	54,000	3,685	105,260	.97	Diam. .16	0.020	do.	
3840	4	.220	Diam.	.088	2,508	66,000	3,810	100,260	1.42	Diam. .155	0.0189	do.	
3841	5	.218	Diam.	.087	2,035	55,000	4,070	110,000	.82	Diam. .185	0.0269	Granular 60 per cent. silky 40 per cent.	
3842	6	.212	Diam.	.085	2,310	66,000	3,850	110,000	.92	Diam. .160	0.0201	Fine silky	Samples from ends of coiled rods after second drawing.
3843	7	.218	Diam.	.087	2,516	68,000	3,816	103,140	1.24	Diam. .155	0.0177	do.	
3844	8	.225	Diam.	.089	2,457	63,000	4,056	104,000	1.42	Diam. .170	0.0227	do.	
3845	9	.217	Diam.	.087	2,294	62,000	3,897	105,320	1.30	Diam. .170	0.0227	do.	
3846	10	.218	Diam.	.087	*2,738	74,000	4,218	114,000	1.18	Diam. .17	0.0227	do.	
3907	1	.1496	.1503	.022	1,540	70,000	2,245	102,040	.10	.1002 × .1002	.010	54.5	Samples from ends of coils after second drawing.
3908	2	.1515	.1513	.0229	1,488	65,000	2,214	98,680	1.7	.1005 × .1005	.0101	55.9	
3809	3	.1505	.1495	.0225	1,575	70,000	2,215	98,440	.06	.10 × .10	.0100	55.6	
3810	4	.1515	.1514	.0229	1,717	75,000	2,362	103,140	.05	.1008 × .1008	.0102	55.4	
3811	5	.1500	.1505	.0225	1,800	80,000	2,430	107,560	.03	.125 × .125	.0156	30.7	
3812	6	.1512	.1508	.0228	1,482	65,000	2,318	101,670	.17	.1002 × .1002	.010	56.1	Samples from ends of coils after third drawing.
3813	7	.1506	.1503	.0226	1,695	73,000	2,432	107,170	.07	.097 × .097	.0094	58.4	
3814	8	.1493	.1494	.0223	1,561	70,000	2,190	98,210	.17	.099 × .099	.0098	56.1	
3815	9	.1514	.1513	.0229	1,946	85,000	2,404	105,000	.03	.110 × .110	.0121	47.2	
3816	10	.1500	.1487	.0223	1,561	70,000	2,341	105,000	.15	.102 × .102	.0104	53.4	
3817	1	.1170	.1172	.0137	1,438	105,000	2,065	150,000	.11	.090 × .090	.0081	40.9	Samples from ends of coils after third drawing.
3818	2	.1175	.1172	.0137	1,376	106,000	2,050	149,640	.12	.086 × .086	.0082	32.8	
3819	3	.1179	.1179	.0139	1,390	100,000	2,182	156,980	.20	.084 × .084	.0071	48.9	
3820	4	.1174	.1174	.0137	1,301	95,000	2,140	156,200	.20	.096 × .096	.0092	32.8	
3821	5	.1174	.1178	.0138	1,380	100,000	2,198	159,280	.11	.097 × .097	.0094	31.9	
3822	6	.1184	.1185	.0140	1,540	110,000	2,184	156,000	.22	.090 × .090	.0081	42.1	Samples from ends of coils after third drawing.
3823	7	.1161	.1160	.0135	1,485	110,000	2,106	156,000	.07	.087 × .087	.0076	43.7	
3824	8	.1193	.1189	.0142	1,491	105,000	2,118	149,150	.13	.086 × .086	.0074	47.9	
3825	9	.1179	.1178	.0139	1,596	115,000	2,147	154,460	.17	.094 × .094	.0088	36.7	
3826	10	.1165	.1169	.0136	1,564	115,000	2,244	165,000	.10	.086 × .086	.0074	45.6	
3827	1	.0996	.0995	.0099	1,188	120,000	1,633	165,000	.07	.078 × .078	.0061	38.4	Samples from ends of coils after third drawing.
3828	2	.0992	.0995	.0099	1,188	120,000	1,584	160,000	.03	.078 × .078	.0061	38.4	







4059	0.978	0.987	0.996	1.440	150,000	1.694	176,460	10	1.0	.078 x .078 = .0061	36.5	Do.
4060	0.988	0.988	0.988	1.372	140,000	1.830	168,370	11	1.1	.078 x .078 = .0061	37.8	Do.
4061	0.987	0.983	0.988	1.619	155,000	1.639	187,650	22	2.2	.079 x .079 = .0062	36.7	Do.
4062	0.984	0.984	0.988	1.372	140,000	1.715	175,000	26	2.6	.080 x .080 = .0064	31.6	Do.
4063	0.980	0.982	0.988	1.421	145,000	1.742	177,760	28	2.8	.082 x .082 = .0066	34.7	Do.
4064	0.982	0.982	0.988	1.328	135,000	1.617	165,000	30	3.0	.077 x .077 = .0059	39.8	Do.
4065	0.986	0.986	0.987	1.455	150,000	1.781	183,610	30	2.0	.078 x .078 = .0061	37.1	Do.
4066	0.980	0.982	0.988	1.421	145,000	1.781	183,610	30	2.0	.077 x .077 = .0059	39.8	Do.
4067	0.987	0.987	0.987	1.408	145,000	1.568	161,180	20	1.0	.078 x .078 = .0061	37.1	Do.
4068	0.982	0.986	0.987	1.455	150,000	1.632	168,250	10	0.7	.078 x .078 = .0061	37.1	Do.
4069	0.982	0.982	0.988	1.325	135,000	1.628	166,120	12	1.2	.082 x .082 = .0067	31.6	Do.
4070	1.003	1.008	1.010	1.414	140,000	1.684	166,730	07	0.7	.080 x .080 = .0064	36.6	Do.
4071	0.983	0.983	0.983	1.309	135,000	1.649	170,000	13	1.3	.080 x .080 = .0064	34.0	Do.
4072	0.983	0.983	0.987	1.261	130,000	1.586	163,500	16	1.6	.077 x .077 = .0059	39.2	Do.
4073	0.987	0.987	0.987	1.372	140,000	1.641	167,450	23	2.3	.074 x .074 = .0055	43.9	Do.
4074	0.983	0.987	0.987	1.212	125,000	1.546	159,380	28	2.8	.079 x .079 = .0062	36.1	Do.
4075	0.988	0.988	0.988	1.274	130,000	1.597	162,960	17	1.7	.071 x .071 = .0050	49.0	Do.
4076	0.986	0.988	0.988	1.450	145,000	1.750	175,000	29	2.9	.074 x .074 = .0055	45.0	Do.
4077	0.986	0.988	0.988	1.436	145,000	1.746	176,360	17	1.7	.073 x .073 = .0053	46.5	Do.
4078	0.985	0.985	0.985	1.372	140,000	1.652	168,570	24	2.4	.073 x .073 = .0053	45.4	Do.
4079	0.985	0.985	0.985	1.372	140,000	1.652	168,570	24	2.4	.073 x .073 = .0053	45.9	Do.
4080	0.983	0.983	0.983	1.436	145,000	1.745	176,260	22	2.2	.076 x .076 = .0058	41.4	Do.
4081	0.985	0.987	0.987	1.372	140,000	1.646	167,960	22	2.2	.077 x .077 = .0059	39.8	Do.
4082	0.985	0.987	0.987	1.355	140,000	1.679	173,080	22	2.2	.075 x .075 = .0056	42.3	Do.
4083	0.983	0.983	0.983	1.287	130,000	1.704	172,120	21	2.1	.077 x .077 = .0059	40.4	Do.
4084	0.987	0.987	0.987	1.336	140,000	1.683	170,000	24	2.4	.076 x .076 = .0058	41.4	Do.
4085	0.987	0.987	0.987	1.455	150,000	1.677	172,890	17	1.7	.077 x .077 = .0059	39.2	Do.
4086	0.982	0.982	0.982	1.388	140,000	1.671	172,890	17	1.7	.078 x .078 = .0061	38.4	Do.
4087	0.987	0.987	0.987	1.274	130,000	1.662	169,790	27	2.7	.078 x .078 = .0061	37.8	Do.
4088	0.983	0.983	0.988	1.323	135,000	1.703	173,780	13	1.3	.078 x .078 = .0061	37.8	Do.
4089	0.985	0.984	0.989	1.436	145,000	1.812	183,030	14	1.4	.082 x .082 = .0067	32.3	Do.
4090	0.985	0.985	0.985	1.450	145,000	1.748	174,800	21	2.1	.076 x .076 = .0058	42.0	Do.
4091	0.986	0.986	0.987	1.406	145,000	1.649	170,000	23	2.3	.077 x .077 = .0059	39.2	Do.
4092	0.986	0.986	0.987	1.261	130,000	1.586	164,540	10	1.0	.085 x .085 = .0072	28.0	Do.
4093	0.986	0.986	0.987	1.550	155,000	1.833	183,300	21	2.1	.078 x .078 = .0061	39.0	Do.
4094	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4095	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4096	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4097	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4098	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4099	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4100	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4101	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4102	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4103	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4104	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4105	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4106	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4107	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4108	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4109	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4110	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4111	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4112	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4113	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4114	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4115	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4116	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4117	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4118	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4119	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4120	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4121	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4122	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4123	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4124	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4125	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4126	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4127	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4128	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4129	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4130	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4131	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.
4132	0.984	0.984	0.984	1.500	150,000	1.789	178,800	28	2.8	.078 x .078 = .0061	39.6	Do.

.1-INCH SQUARE TINNED STEEL WIRE—Continued.

No. of Mark on test. specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.
	Width.	Thick-ness.		Total.	Per square inch.	Total.	Per square inch.	Inch.	Per cent.			
4123	.0985	.0988	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	.21	2.1	.072 × .072 = .0052	Per cent.	Fine, silky.
4134	.0994	.0985	.0098	1,274	130,000	1,638	167,140	.27	2.7	.077 × .077 = .0059	46.9	Do.
4135	.0986	.0981	.0097	1,237	125,000	1,618	163,430	.20	2.0	.076 × .076 = .0058	40.4	Do.
4136	.0989	.0986	.0098	1,274	130,000	1,606	165,150	.22	2.2	.077 × .077 = .0059	40.2	Do.
4137	.0997	.0986	.0099	1,436	145,000	1,736	163,880	.10	1.0	.082 × .082 = .0067	39.8	Do.
4138	.1010	.1000	.010	1,600	160,000	1,877	175,350	.23	2.3	.083 × .083 = .0069	32.3	Do.
4139	.0990	.0991	.0098	1,470	151,000	1,792	187,700	.22	2.2	.078 × .078 = .0061	31.0	Do.
4140	.0993	.0996	.0099	1,436	145,000	1,704	182,860	.18	1.8	.076 × .076 = .0058	37.8	Do.
4141	.0983	.0985	.0093	1,386	140,000	1,690	172,120	.17	1.7	.078 × .078 = .0061	41.4	Do.
							170,710				38.4	

**SQUARE AND FLAT TINNED AND UNTINNED STEEL WIRE  
FURNISHED BY ROWLAND A. ROBBINS.**

**FIRST LOT.**

*Coil No. 1.*

**TINNED WIRE—.10 SQUARE.**

**No. 3371.**

Sectional area,  $.1010 \times .1012 = .0102$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
51	5,000	0.	0.	0.	0.	Initial load.
204	20,000	.00069	.00069	.....	.....	
408	40,000	.00136	.00067	.....	.....	
612	60,000	.00216	.00080	.....	.....	
663	65,000	.00234	.00018	.....	.....	
714	70,000	.00258	.00024	.....	.....	
765	75,000	.00279	.00021	.....	.....	
816	80,000	.00298	.00019	.....	.....	
867	85,000	.00326	.00028	.....	.....	
915	90,000	.00346	.00020	.....	.....	
969	95,000	.00370	.00024	.....	.....	
1,020	100,000	.00388	.00018	.....	.....	
1,071	105,000	.00416	.00028	.....	.....	
1,122	110,000	.00450	.00034	.....	.....	
1,173	115,000	.00480	.00030	.....	.....	
1,224	120,000	.00511	.00031	.....	.....	Elastic limit.
1,275	125,000	.00548	.00037	.....	.....	
1,326	130,000	.00590	.00042	.....	.....	
1,377	135,000	.00637	.00047	.....	.....	
1,428	140,000	.00693	.00056	.....	.....	
1,479	145,000	.00771	.00078	.....	.....	
1,530	150,000	.00864	.00093	.....	.....	
1,581	155,000	.00985	.00121	.....	.....	
1,632	160,000	.014	.00415	.....	.....	
1,683	165,000	.018	.004	.....	.....	
1,734	170,000	.025	.007	.....	.....	Tensile strength.
1,742	170,780	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds 170,780  
 Elastic limit per square inch of original section.....do... 125,000  
 Elongation per inch after rupture.....inch... .017  
 Elongation per inch under strain at elastic limit.....do... .00548  
 Reduction in area after rupture, per centum of original section..... 42.1  
 Position of rupture.....3".4 outside the gauged section  
 Character of broken surface.....silky

No. 3372.

Sectional area,  $''1005 \times ''1012 = .0102$  square inch.  
 Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
51	5,000	0.	0.	0.	0.	
204	20,000	.00058	.00058	.....	.....	
408	40,000	.00123	.00065	.....	.....	
612	60,000	.00204	.00081	.....	.....	
663	65,000	.00224	.00020	.....	.....	
714	70,000	.00240	.00016	.....	.....	
765	75,000	.00262	.00022	.....	.....	
816	80,000	.00283	.00021	.....	.....	
867	85,000	.00305	.00022	.....	.....	
918	90,000	.00326	.00021	.....	.....	
969	95,000	.00346	.00020	.....	.....	
1,020	100,000	.00371	.00025	.....	.....	
1,071	105,000	.00391	.00020	.....	.....	
1,122	110,000	.00416	.00025	.....	.....	
1,173	115,000	.00440	.00024	.....	.....	
1,224	120,000	.00470	.00030	.....	.....	
1,275	125,000	.00497	.00027	.....	.....	
1,326	130,000	.00531	.00034	.....	.....	
1,377	135,000	.00563	.00032	.....	.....	Elastic limit.
1,428	140,000	.00603	.00040	.....	.....	
1,479	145,000	.00650	.00047	.....	.....	
1,530	150,000	.00707	.00057	.....	.....	
1,581	155,000	.00787	.00080	.....	.....	
1,632	160,000	.00905	.00118	.....	.....	Tensile strength.
1,683	165,000	.01152	.00247	.....	.....	
1,734	170,000	.017	.00548	.....	.....	
1,777	174,220	.022	.005	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 174,220  
 Elastic limit per square inch of original section ..... do... 135,000  
 Elongation per inch after rupture ..... inch... .011  
 Elongation per inch under strain at elastic limit ..... do... .00563  
 Reduction in area after rupture, per centum of original section ..... 37.2  
 Position of rupture ..... 6''/4 outside the gauged section  
 Character of broken surface ..... silky

No. 3373.

Sectional area,  $''\cdot1014 \times ''\cdot1009 = \cdot0102$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
51	5,000	0.	0.	0.	0.	Initial load.
204	20,000	.00068	.00068	.....	.....	
408	40,000	.00142	.00074	.....	.....	
612	60,000	.00224	.00082	.....	.....	
663	65,000	.00239	.00015	.....	.....	
714	70,000	.00263	.00024	.....	.....	
765	75,000	.00281	.00018	.....	.....	
816	80,000	.00303	.00022	.....	.....	
867	85,000	.00327	.00024	.....	.....	
918	90,000	.00346	.00019	.....	.....	
969	95,000	.00371	.00025	.....	.....	
1,020	100,000	.00392	.00021	.....	.....	
1,071	105,000	.00420	.00028	.....	.....	
1,122	110,000	.00448	.00028	.....	.....	
1,173	115,000	.00478	.00030	.....	.....	
1,224	120,000	.00511	.00033	.....	.....	Elastic limit.
1,275	125,000	.00547	.00036	.....	.....	
1,326	130,000	.00583	.00036	.....	.....	
1,377	135,000	.00629	.00046	.....	.....	
1,428	140,000	.00680	.00051	.....	.....	
1,479	145,000	.00760	.00080	.....	.....	
1,530	150,000	.00856	.00096	.....	.....	
1,581	155,000	.00968	.00112	.....	.....	
1,632	160,000	.01162	.00194	.....	.....	
1,683	165,000	.017	.00538	.....	.....	
1,734	170,000	.023	.006	.....	.....	Tensile strength.
1,749	171,470	.029	.006	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 171,470  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch.. 0.22  
 Elongation per inch under strain at elastic limit.....do... .00583  
 Reduction in area after rupture, per centum of original section..... 37.2  
 Position of rupture.....at one end of gauged section  
 Character of broken surface.....silky

## Coil No. 2.

FLAT TINNED WIRE ".15×".075.

No 3374.

Sectional area ".1485×".0790=.011 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00070	.00070	.....	.....	
440	40,000	.00144	.00074	.....	.....	
660	60,000	.00219	.00075	.....	.....	
715	65,000	.00240	.00021	.....	.....	
770	70,000	.00257	.00017	.....	.....	
825	75,000	.00277	.00020	.....	.....	
880	80,000	.00299	.00022	.....	.....	
935	85,000	.00315	.00016	.....	.....	
990	90,000	.00339	.00024	.....	.....	
1,045	95,000	.00354	.00015	.....	.....	
1,100	100,000	.00374	.00020	.....	.....	
1,155	105,000	.00395	.00021	.....	.....	
1,210	110,000	.00420	.00025	.....	.....	
1,265	115,000	.00442	.00022	.....	.....	
1,320	120,000	.00466	.00024	.....	.....	
1,375	125,000	.00491	.00025	.....	.....	
1,430	130,000	.00511	.00020	.....	.....	
1,485	135,000	.00541	.00030	.....	.....	
1,540	140,000	.00570	.00029	.....	.....	
1,595	145,000	.00600	.00030	.....	.....	
1,650	150,000	.00634	.00034	.....	.....	
1,705	155,000	.00668	.00034	.....	.....	Elastic limit.
1,760	160,000	.00718	.00050	.....	.....	
1,815	165,000	.00777	.00059	.....	.....	
1,870	170,000	.00862	.00085	.....	.....	
1,925	175,000	.01002	.00140	.....	.....	
1,980	180,000	.011	.00098	.....	.....	
2,035	185,000	.018	.007	.....	.....	
2,062	187,450	.019	.001	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 187,450  
 Elastic limit per square inch of original section.....do... 155,000  
 Elongation per inch after rupture.....inch... .008  
 Elongation per inch under strain at elastic limit.....do... .00668  
 Reduction in area after rupture, per centum of original section ..... 17.3  
 Position of rupture .....2"4 outside the gauged section  
 Character of broken surface.....silky



## No. 3375.

Sectional area,  $".1485 \times ".0790 = .011$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5, 000	0.	0.	0.	0.	Initial load.
220	20, 000	.00068	.00068	.....	.....	
440	40, 000	.00141	.00073	.....	.....	
660	60, 000	.00208	.00067	.....	.....	
715	65, 000	.00227	.00019	.....	.....	
770	70, 000	.00247	.00020	.....	.....	
825	75, 000	.00267	.00020	.....	.....	
880	80, 000	.00282	.00015	.....	.....	
935	85, 000	.00308	.00026	.....	.....	
990	90, 000	.00324	.00016	.....	.....	
1, 045	95, 000	.00343	.00019	.....	.....	
1, 100	100, 000	.00366	.00023	.....	.....	
1, 155	105, 000	.00387	.00021	.....	.....	
1, 210	110, 000	.00408	.00021	.....	.....	
1, 265	115, 000	.00431	.00023	.....	.....	
1, 320	120, 000	.00456	.00025	.....	.....	
1, 375	125, 000	.00481	.00025	.....	.....	
1, 430	130, 000	.00510	.00029	.....	.....	
1, 485	135, 000	.00535	.00025	.....	.....	
1, 540	140, 000	.00567	.00032	.....	.....	
1, 595	145, 000	.00600	.00033	.....	.....	Elastic limit.
1, 650	150, 000	.00636	.00036	.....	.....	
1, 705	155, 000	.00686	.00050	.....	.....	
1, 760	160, 000	.00730	.00044	.....	.....	
1, 815	165, 000	.00803	.00073	.....	.....	
1, 870	170, 000	.00891	.00088	.....	.....	
1, 925	175, 000	.01024	.00133	.....	.....	
1, 980	180, 000	.014	.00376	.....	.....	
2, 035	185, 000	.020	.006	.....	.....	
2, 055	186, 820	.025	.005	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 186, 820  
 Elastic limit per square inch of original section.....do... 150, 000  
 Elongation per inch after rupture.....inch... .018  
 Elongation per inch under strain at elastic limit.....do... .00636  
 Reduction in area after rupture, per centum of original section.....22.7  
 Position of rupture.....1".40 inside the gauged section  
 Character of broken surface.....silky, slightly granular

No. 3376.

Sectional area,  $".1485 \times ".0786 = .011$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5, 000	0.	0.	0.	0.	
220	20, 000	.00063	.00063	.....	.....	
440	40, 000	.00125	.00062	.....	.....	
660	60, 000	.00195	.00070	.....	.....	
715	65, 000	.00214	.00019	.....	.....	
770	70, 000	.00231	.00017	.....	.....	
825	75, 000	.00251	.00020	.....	.....	
880	80, 000	.00271	.00020	.....	.....	
935	85, 000	.00291	.00020	.....	.....	
990	90, 000	.00315	.00024	.....	.....	
1, 045	95, 000	.00330	.00015	.....	.....	
1, 100	100, 000	.00356	.00026	.....	.....	
1, 155	105, 000	.00378	.00020	.....	.....	
1, 210	110, 000	.00405	.00029	.....	.....	
1, 265	115, 000	.00431	.00026	.....	.....	
1, 320	120, 000	.00456	.00025	.....	.....	
1, 375	125, 000	.00486	.00030	.....	.....	
1, 430	130, 000	.00515	.00029	.....	.....	
1, 485	135, 000	.00547	.00032	.....	.....	
1, 540	140, 000	.00580	.00033	.....	.....	Elastic limit.
1, 595	145, 000	.00613	.00033	.....	.....	
1, 650	150, 000	.00655	.00042	.....	.....	
1, 705	155, 000	.00712	.00057	.....	.....	
1, 760	160, 000	.00765	.00053	.....	.....	
1, 815	165, 000	.00852	.00087	.....	.....	
1, 870	170, 000	.00985	.00133	.....	.....	
1, 925	175, 000	.013	.00315	.....	.....	
1, 980	180, 000	.018	.005	.....	.....	
2, 035	185, 000	.026	.008	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section..... pounds.. 185, 000  
 Elastic limit per square inch of original section..... do... 145, 000  
 Elongation per inch after rupture..... inch... .012  
 Elongation per inch under strain at elastic limit..... do... .00613  
 Reduction in area after rupture, per centum of original section..... 15.5  
 Position of rupture..... ".6 outside the gauged section  
 Character of broken surface..... silky, oblique

## Coil No. 3.

## ".10 SQUARE WIRE.

No. 3377.

Sectional area,  $".1015 \times ".1003 = .0102$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
51	5,000	0.	0.	0.	0.	Initial load.
204	20,000	.00076	.00076	.....	.....	
408	40,000	.00161	.00085	.....	.....	
612	60,000	.00249	.00088	.....	.....	
663	65,000	.00267	.00018	.....	.....	
714	70,000	.00294	.00027	.....	.....	
765	75,000	.00321	.00027	.....	.....	
816	80,000	.00350	.00029	.....	.....	
867	85,000	.00372	.00022	.....	.....	
918	90,000	.00402	.00030	.....	.....	
969	95,000	.00431	.00029	.....	.....	
1,020	100,000	.00461	.00030	.....	.....	
1,071	105,000	.00498	.00037	.....	.....	
1,122	110,000	.00541	.00043	.....	.....	
1,173	115,000	.00573	.00032	.....	.....	Elastic limit.
1,224	120,000	.00614	.00041	.....	.....	
1,275	125,000	.00665	.00051	.....	.....	
1,326	130,000	.00720	.00055	.....	.....	
1,377	135,000	.00780	.00060	.....	.....	
1,428	140,000	.00858	.00078	.....	.....	
1,479	145,000	.00953	.00095	.....	.....	
1,530	150,000	.01090	.00137	.....	.....	
1,581	155,000	.012	.0011	.....	.....	
1,632	160,000	.014	.002	.....	.....	Tensile strength.
1,683	165,000	.020	.006	.....	.....	

## General summary.

Tensile strength, per square inch of original section ..... pounds.. 165,000  
 Elastic limit, per square inch of original section ..... do... 115,000  
 Elongation per inch after rupture ..... inch... .010  
 Elongation per inch under strain at elastic limit ..... do... .00573  
 Reduction in area after rupture, per centum of original section ..... 43.1  
 Position of rupture ..... 1", 25 outside the gauged section  
 Character of broken surface ..... silky

No. 3378.

Sectional area,  $''1013 \times ''1003 = .0102$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
51	5,000	0.	0.	0.	0.	
204	20,000	.00079	.00079	.....	.....	
408	40,000	.00153	.00074	.....	.....	
612	60,000	.00244	.00091	.....	.....	
663	65,000	.00260	.00016	.....	.....	
714	70,000	.00289	.00029	.....	.....	
765	75,000	.00312	.00023	.....	.....	
816	80,000	.00334	.00022	.....	.....	
867	85,000	.00363	.00029	.....	.....	
918	90,000	.00388	.00025	.....	.....	
969	95,000	.00414	.00026	.....	.....	
1,020	100,000	.00454	.00040	.....	.....	
1,071	105,000	.00490	.00036	.....	.....	
1,122	110,000	.00527	.00037	.....	.....	
1,173	115,000	.00571	.00044	.....	.....	
1,224	120,000	.00617	.00046	.....	.....	
1,275	125,000	.00661	.00044	.....	.....	
1,326	130,000	.00732	.00071	.....	.....	
1,377	135,000	.00794	.00062	.....	.....	
1,428	140,000	.00890	.00096	.....	.....	
1,479	145,000	.01008	.00118	.....	.....	Elastic limit.
1,530	150,000	.012	.002	.....	.....	
1,581	155,000	.014	.002	.....	.....	
1,632	160,000	.018	.004	.....	.....	
1,683	163,530	.025	.007	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....	pounds..	163,530
Elastic limit per square inch of original section.....	do..	110,000
Elongation per inch after rupture.....	inch..	.022
Elongation per inch under strain at elastic limit.....	do..	.00527
Reduction in area after rupture, per centum of original section.....		45.1
Position of rupture.....	1''.53 inside the gauged section	
Character of broken surface.....	silky	

No. 3379.

Sectional area,  $".1013 \times ".1003 = .0102$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
51	5,000	0.	0.	0.	0.	Initial load.
204	20,000	.00070	.00070	.....	.....	
408	40,000	.00154	.00084	.....	.....	
612	60,000	.00242	.00088	.....	.....	
663	65,000	.00260	.00018	.....	.....	
714	70,000	.00285	.00025	.....	.....	
765	75,000	.00308	.00023	.....	.....	
816	80,000	.00333	.00025	.....	.....	
867	85,000	.00358	.00025	.....	.....	
918	90,000	.00388	.00030	.....	.....	
969	95,000	.00417	.00029	.....	.....	
1,020	100,000	.00443	.00026	.....	.....	
1,071	105,000	.00478	.00035	.....	.....	
1,122	110,000	.00512	.00034	.....	.....	
1,173	115,000	.00538	.00026	.....	.....	Elastic limit.
1,224	120,000	.00581	.00043	.....	.....	
1,275	125,000	.00621	.00040	.....	.....	
1,326	130,000	.00665	.00044	.....	.....	
1,377	135,000	.00725	.00060	.....	.....	
1,428	140,000	.00800	.00075	.....	.....	
1,479	145,000	.00879	.00079	.....	.....	
1,530	150,000	.00987	.00108	.....	.....	
1,581	155,000	.012	.00213	.....	.....	
1,632	160,000	.014	.002	.....	.....	Tensile strength.
1,683	165,000	.018	.004	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 165,000  
 Elastic limit per square inch of original section ..... do... 115,000  
 Elongation per inch after rupture ..... inch... .007  
 Elongation per inch under strain at elastic limit ..... do... .00538  
 Reduction in area after rupture, per centum of original section ..... 43.1  
 Position of rupture ..... 4" outside the gauged section  
 Character of broken surface ..... silky

## Coil No. 4.

FLAT WIRE  $".15 \times ".075$ .

No. 3380.

Sectional area,  $".1473 \times ".0744 = .0109$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
218	20,000	.00078	.00078	.....	.....	
436	40,000	.00158	.00080	.....	.....	
654	60,000	.00243	.00085	.....	.....	
709	65,000	.00263	.00020	.....	.....	
763	70,000	.00288	.00025	.....	.....	
818	75,000	.00316	.00028	.....	.....	
872	80,000	.00336	.00020	.....	.....	
927	85,000	.00365	.00029	.....	.....	
981	90,000	.00390	.00025	.....	.....	
1,036	95,000	.00415	.00025	.....	.....	
1,090	100,000	.00450	.00035	.....	.....	
1,145	105,000	.00485	.00035	.....	.....	
1,199	110,000	.00535	.00050	.....	.....	Elastic limit.
1,254	115,000	.00560	.00025	.....	.....	
1,308	120,000	.00605	.00045	.....	.....	
1,363	125,000	.00654	.00049	.....	.....	
1,417	130,000	.00709	.00055	.....	.....	
1,472	135,000	.00765	.00056	.....	.....	
1,526	140,000	.00838	.00073	.....	.....	
1,581	145,000	.00914	.00076	.....	.....	
1,635	150,000	.01024	.00110	.....	.....	
1,690	155,000	.012	.00176	.....	.....	
1,744	160,000	.014	.002	.....	.....	Tensile strength.
1,799	165,000	.017	.003	.....	.....	
1,853	170,000	.020	.003	.....	.....	
1,897	174,040	.037	.017	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 174,040  
 Elastic limit per square inch of original section.....do... 115,000  
 Elongation per inch after rupture.....inch... .029  
 Elongation per inch under strain at elastic limit.....do... .00560  
 Reduction in area after rupture, per centum of original section.....29.4  
 Position of rupture.....".50 inside the gauged section  
 Character of broken surface.....silky

## No. 3381.

Sectional area,  $'' .1475 \times '' .0744 = .0109$  square inch.  
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5, 000	0.	0.	.....	.....	Initial load.
218	20, 000	.00065	.00065	.....	.....	
436	40, 000	.00145	.00080	.....	.....	
654	60, 000	.00230	.00085	.....	.....	
709	65, 000	.00250	.00020	.....	.....	
763	70, 000	.00275	.00025	.....	.....	
818	75, 000	.00300	.00025	.....	.....	
872	80, 000	.00320	.00020	.....	.....	
927	85, 000	.00350	.00030	.....	.....	
981	90, 000	.00380	.00030	.....	.....	
1, 036	95, 000	.00411	.00031	.....	.....	Elastic limit.
1, 090	100, 000	.00446	.00035	.....	.....	
1, 145	105, 000	.00484	.00038	.....	.....	
1, 199	110, 000	.00521	.00037	.....	.....	
1, 254	115, 000	.00566	.00045	.....	.....	
1, 308	120, 000	.00614	.00048	.....	.....	
1, 363	125, 000	.00666	.00052	.....	.....	
1, 417	130, 000	.00723	.00057	.....	.....	
1, 472	135, 000	.00790	.00067	.....	.....	
1, 526	140, 000	.00863	.00073	.....	.....	
1, 581	145, 000	.00950	.00087	.....	.....	Tensile strength.
1, 635	150, 000	.01076	.00126	.....	.....	
1, 690	155, 000	.013	.00224	.....	.....	
1, 744	160, 000	.015	.002	.....	.....	
1, 799	165, 000	.018	.003	.....	.....	
1, 853	170, 000	.024	.006	.....	.....	
1, 896	173, 940	.035	.011	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 173, 940  
Elastic limit per square inch of original section.....do... 110, 000  
Elongation per inch after rupture.....inch... .029  
Elongation per inch under strain at elastic limit.....do... .00521  
Reduction in area after rupture, per centum of original section..... 25.7  
Position of rupture .....4'' inside the gauged section  
Character of broken surface .....silky

No. 3382.

Sectional area,  $".1472 \times ".0743 = .0109$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
218	20,000	.00066	.00066	.....	.....	
436	40,000	.00148	.00082	.....	.....	
654	60,000	.00238	.00090	.....	.....	
709	65,000	.00258	.00020	.....	.....	
763	70,000	.00282	.00024	.....	.....	
818	75,000	.00307	.00025	.....	.....	
872	80,000	.00333	.00026	.....	.....	
927	85,000	.00363	.00030	.....	.....	
981	90,000	.00393	.00030	.....	.....	
1,036	95,000	.00421	.00028	.....	.....	
1,090	100,000	.00455	.00034	.....	.....	
1,145	105,000	.00493	.00038	.....	.....	
1,199	110,000	.00533	.00040	.....	.....	
1,254	115,000	.00573	.00040	.....	.....	Elastic limit.
1,308	120,000	.00623	.00050	.....	.....	
1,363	125,000	.00667	.00044	.....	.....	
1,417	130,000	.00718	.00051	.....	.....	
1,472	135,000	.00778	.00060	.....	.....	
1,526	140,000	.00855	.00077	.....	.....	
1,581	145,000	.00930	.00075	.....	.....	
1,635	150,000	.01034	.00104	.....	.....	
1,690	155,000	.012	.00166	.....	.....	
1,744	160,000	.014	.002	.....	.....	
1,799	165,000	.016	.002	.....	.....	Tensile strength.
1,838	168,620	.018	.002	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds. 168,620  
 Elastic limit per square inch of original section ..... do. 115,000  
 Elongation per inch after rupture ..... inch. .007  
 Elongation per inch under strain at elastic limit ..... do. .00573  
 Reduction in area after rupture, per centum of original section ..... 28.4  
 Position of rupture ..... ".75 outside the gauged section  
 Character of broken surface ..... silky



## SECOND LOT.

*Description.*

Surface of wire.	Nominal dimensions.	Actual dimensions.		Weight of coil.		Diameter of curve of wire.	
		One end.	Other end.	Pounds.	Ounces.	In coil.	When released.
Tinned.	".15×".15	".1506×".1502	".1486×".1493	21	0	17"	32"

The wire coiled over an arbor equal in diameter to its diagonal without fracture.

The general surface of the wire was smooth and the corners rounded to about ".01 radius.

The tinning appeared continuous without naked spots, but of excessive thickness in places.

Along one surface locally the tin was found to be ".013 thick, and generally the coating appeared to be from ".0003 to ".0005 thick.

No. 3784.

Sectional area, ".1488×".1496=.022 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
110	5,000	0.	0.	0.	0.	Initial load.
440	20,000	.00066	.00066	.....	.....	
880	40,000	.00137	.00071	.....	.....	
1,320	60,000	.00211	.00074	.....	.....	
1,760	80,000	.00294	.00083	.....	.....	
2,200	100,000	.00388	.00094	.....	.....	Elastic limit.
2,310	105,000	.00417	.00029	.....	.....	
2,420	110,000	.00444	.00027	.....	.....	
2,530	115,000	.00473	.00029	.....	.....	
2,640	120,000	.00507	.00034	.....	.....	
2,750	125,000	.00548	.00041	.....	.....	
2,860	130,000	.00588	.00040	.....	.....	
2,970	135,000	.00638	.00050	.....	.....	
3,080	140,000	.00690	.00052	.....	.....	
3,190	145,000	.00771	.00081	.....	.....	
3,300	150,000	.00876	.00105	.....	.....	Tensile strength.
3,410	155,000	.01029	.00153	.....	.....	
3,520	160,000	.015	.00471	.....	.....	
3,630	165,000	.020	.005	.....	.....	
3,678	167,180	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 167,180  
 Elastic limit per square inch of original section.....do... 120,000  
 Elongation per inch after rupture.....inch... .012  
 Elongation per inch under strain at elastic limit.....do... .00507  
 Reduction in area after rupture, per centum of original section.....27.3  
 Position of rupture.....2", 9 outside the gauged section  
 Character of broken surface.....fine silky

No. 3785.

Sectional area,  $''1495 \times ''1490 = .022$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
110	5,000	0.	0.	0.	0.	Initial load.
440	20,000	.00059	.00059	.....	.....	
880	40,000	.00139	.00080	.....	.....	
1,320	60,000	.00215	.00076	.....	.....	
1,760	80,000	.00305	.00090	.....	.....	
2,200	100,000	.00413	.00108	.....	.....	Elastic limit.
2,310	105,000	.00439	.00026	.....	.....	
2,420	110,000	.00478	.00039	.....	.....	
2,530	115,000	.00519	.00041	.....	.....	
2,640	120,000	.00564	.00045	.....	.....	
2,750	125,000	.00614	.00050	.....	.....	
2,860	130,000	.00671	.00057	.....	.....	
2,970	135,000	.00740	.00069	.....	.....	
3,080	140,000	.00829	.00089	.....	.....	
3,190	145,000	.00950	.00121	.....	.....	
3,300	150,000	.012	.0025	.....	.....	
3,410	155,000	.014	.002	.....	.....	
3,520	160,000	.019	.005	.....	.....	
3,630	165,000	.029	.010	.....	.....	
3,650	165,910	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 165,910  
 Elastic limit per square inch of original section ..... do... 110,000  
 Elongation per inch after rupture..... inch... .024  
 Elongation per inch under strain at elastic limit..... do... .00478  
 Reduction in area after rupture, per centum of original section ..... 29.1  
 Position of rupture..... at middle of specimen  
 Character of broken surface ..... fine silky

No. 3786.

Sectional area,  $.1486 \times .1506 = .022$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
110	5,000	0.	0.	0.	0.	Initial load.
440	20,000	.00053	.00053	.....	.....	
880	40,000	.00128	.00075	.....	.....	
1,320	60,000	.00205	.0007	.....	.....	
1,760	80,000	.00284	.00079	.....	.....	
2,200	100,000	.00369	.00085	.....	.....	
2,640	105,000	.00398	.00029	.....	.....	
2,420	110,000	.00419	.00321	.....	.....	
2,530	115,000	.00445	.00026	.....	.....	
2,640	120,000	.00477	.00032	.....	.....	
2,750	125,000	.00505	.00028	.....	.....	Elastic limit.
2,860	130,000	.00542	.00037	.....	.....	
2,970	135,000	.00592	.00050	.....	.....	
3,080	140,000	.00628	.00036	.....	.....	
3,190	145,000	.00689	.00061	.....	.....	
3,300	150,000	.00776	.00087	.....	.....	
3,410	155,000	.00914	.00138	.....	.....	
3,520	160,000	.013	.00386	.....	.....	
3,630	165,000	.017	.004	.....	.....	
3,740	170,000	.028	.011	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 170,000  
 Elastic limit per square inch of original section.....do... 130,000  
 Elongation per inch after rupture.....inch... .015  
 Elongation per inch under strain at elastic limit.....do... .00542  
 Reduction in area after rupture, per centum of original section.....do... 27.3  
 Position of rupture.....4".25 outside the gauged section  
 Character of broken surface.....fine silky

TABULATION OF SQUARE AND FLAT STEEL WIRE.

[Furnished by Rowland A. Robbins.]

## FIRST LOT.

No. of test.	Mark on specimen.	Dimensions.		Sec. tional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Con- traction of area.	Appearance of fracture.	Remarks.
		Width.	Thick- ness.		Total.	Per square inch.	Total.	Per square inch.	Inch.	Per cent.				
3371	1	.1010	.1012	Sq. in. .0102	Pounds. 1,275	Pounds. 125,000	Pounds. 1,742	Pounds. 170,780	.17	1.7	" " Sq. inch. .077 × .077 = .0059	Per ct. 42.1	Silky	} Tinned coil.
3372	1	.1012	.1015	.0102	1,377	135,000	1,777	174,220	.11	1.1	.080 × .080 = .0064	37.2	do	
3373	1	.1014	.1009	.0102	1,326	130,000	1,749	171,470	.22	2.2	.080 × .080 = .0064	37.2	do	} Tinned coil.
3374	2	.1485	.0790	.011	1,705	155,000	2,032	187,450	.08	0.8	.140 × .065 = .0091	17.3	do	
3375	2	.1485	.0790	.011	1,650	150,000	2,055	186,520	.18	1.8	.130 × .065 = .0085	22.7	Silky slightly granular.	} Tinned coil.
3376	2	.1485	.0786	.011	1,595	145,000	2,035	185,000	.12	1.2	.137 × .065 = .0093	15.5	Silky oblique.	
3377	3	.1013	.1003	.0102	1,173	115,000	1,683	166,000	.10	1.0	.076 × .076 = .0058	43.1	Silky	} Coil not tinned.
3378	3	.1013	.1003	.0102	1,122	110,000	1,668	163,530	.22	2.2	.075 × .075 = .0056	45.1	do	
3379	3	.1013	.1003	.0102	1,173	115,000	1,683	165,000	.07	0.7	.076 × .076 = .0058	43.1	do	} Coil not tinned.
3381	4	.1475	.0744	.0109	1,254	115,000	1,897	174,040	.29	2.9	.128 × .060 = .0077	29.4	do	
3382	4	.1472	.0743	.0109	1,199	110,000	1,896	173,940	.29	2.9	.125 × .065 = .0081	25.7	do	} Coil not tinned.
					1,254	115,000	1,838	168,620	.07	0.7	.130 × .060 = .0078	28.4	do	

## SECOND LOT.

3784	.....	.1488	.1496	.022	2,640	120,000	3,678	167,180	.12	1.2	.127 × .127 = .016	27.3	Fine silky	} Tinned coil.
3785	.....	.1495	.1490	.022	2,420	110,000	3,650	165,910	.24	2.4	.125 × .125 = .0156	28.1	do	
3786	.....	.1486	.1506	.022	2,860	130,000	3,740	170,000	.15	1.5	.127 × .127 = .016	27.3	do	

## ELECTRICALLY WELDED STEEL WIRE.

[Samples from coils furnished by Rowland A. Robbins.]

No. of test.	No. of coil.	Welding burr.	Size at weld.	Dimensions of wire.		Sectional area of wire.	Tensile strength.		Fracture.
				Width.	Thick-ness.		Total.	Per square inch.	
3548	1	Not removed	"	Inch.	Inch.	Sq. inch.	Pounds.	Pounds.	" 18 from middle of welding burr. Fine silky.
3549	1	Removed	180 X .170	.1006	.1010	.010	1,310	131,000	" 10 from weld. Fine silky.
3550	1	do	1012 X .1041	.1012	.1010	.011	1,394	126,730	At the weld. Granular.
3551	1	do	1012 X .1048	.1008	.1006	.010	1,327	132,700	" 18 from the weld. Fine silky.
3552	1	do	1015 X .1047	.1006	.1021	.010	1,269	126,900	" 16 from the weld. Fine silky.
3553	2	Not removed	1020 X .1008	.1008	.1003	.010	1,363	136,300	" 23 from middle of welding burr. Fine silky.
3554	2	Removed	215 X .147	.1480	.0785	.012	1,602	133,500	At the weld. Granular.
3555	2	do	149 X .075	.1490	.0780	.012	1,574	131,170	Do.
3556	2	do	1502 X .0787	.1490	.0780	.012	1,647	137,250	" 22 from the weld. Granular, silky center.
3557	2	do	1500 X .0775	.1495	.0780	.012	1,718	143,170	" 20 from the weld. Granular, silky center.
3558	3	Not removed	1483 X .0786	.1495	.0780	.012	1,686	140,500	" 15 from middle of welding burr. Fine, silky.
3559	3	Removed	170 X .180	.1004	.1003	.010	1,274	127,400	At the weld. Granular; dull colored corner.
3560	3	do	1004 X .1005	.1003	.1005	.010	1,090	109,800	At the weld. Granular in part; dull silky.
3561	3	do	1007 X .0990	.1003	.1004	.010	1,153	115,300	Do.
3562	3	do	1004 X .0996	.1003	.1002	.010	988	96,800	At or near the weld. Silky, with granular center.
3563	3	do	1005 X .0996	.1004	.1004	.010	1,105	110,500	" 22 from middle of welding burr. Fine silky.
3564	4	Not removed	220 X .160	.1487	.0742	.011	1,608	146,180	At the weld. Granular, dull silky at one edge.
3565	4	Removed	1473 X .0748	.1486	.0740	.011	1,092	92,730	At or near the weld. Granular, dull silky at one edge.
3566	4	do	1481 X .0745	.1490	.0740	.011	1,464	133,090	At or near the weld. Granular, radiating from a silky spot at corner.
3567	4	do	1483 X .0744	.1484	.0740	.011	1,395	126,820	At or near the weld. Granular.
	4	do	1492 X .0748	.1490	.0743	.011	1,395	126,820	

# SQUARE AND FLAT TINNED AND UNTINNED STEEL WIRE FROM R. H. WOLFF & CO., LIMITED.

## FIRST LOT.

Coil No. 1. Weight, 58½ pounds.

".10 SQUARE WIRE.

No 3146.

Sectional area,  $".0994 \times ".0994 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
49	5,000	0.	0.	0.	0.	
196	20,000	.00064	.00064			
392	40,000	.00144	.00080	.00004	.00004	
588	60,000	.00224	.00080			
784	80,000	.00304	.00080			
980	100,000	.00396	.00092	.00025	.00021	
1,029	105,000	.00427	.00031			
1,078	110,000	.00450	.00023			
1,127	115,000	.00476	.00026			
1,176	120,000	.00503	.00027			
1,225	125,000	.00530	.00027			
1,274	130,000	.00559	.00029			
1,323	135,000	.00594	.00035			
1,372	140,000	.00624	.00030			
1,421	145,000	.00662	.00038			Elastic limit.
1,470	150,000	.00695	.00033			
1,519	155,000	.00739	.00044			
1,568	160,000	.00769	.00030			
1,617	165,000	.00817	.00048			
1,666	170,000	.00869	.00052			
1,715	175,000	.00914	.00045			
1,764	180,000	.00968	.00054			
1,813	185,000	.01032	.00064			
1,862	190,000	.01106	.00074			
1,911	195,000	.013	.00194			Tensile strength.
1,960	200,000	.014	.001			
2,009	205,000	.015	.001			
2,058	210,000	.017	.002			
2,107	215,000	.019	.002			
2,148	219,180					

## General summary.

Tensile strength per square inch of original section .....	pounds..	219,180
Elastic limit per square inch of original section .....	do..	160,000
Elongation per inch after rupture .....	inch..	.009
Elongation per inch under strain at elastic limit .....	do..	.00769
Reduction in area after rupture, per centum of original section .....		34.7
Position of rupture .....	.4".5 outside the gauged section	
Character of broken surface .....	fine silky	

No. 3147.

Sectional area,  $".0994 \times ".0994 = .0098$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00068	.00068	.....	.....	
392	40,000	.00144	.00076	.....	.....	
588	60,000	.00220	.00076	.....	.....	
784	80,000	.00300	.00080	.....	.....	
980	100,000	.00389	.00089	.....	.....	
1,029	105,000	.00408	.00019	.....	.....	
1,078	110,000	.00433	.00025	.....	.....	
1,127	115,000	.00459	.00026	.....	.....	
1,176	120,000	.00485	.00026	.....	.....	
1,225	125,000	.00513	.00028	.....	.....	
1,274	130,000	.00539	.00026	.....	.....	
1,323	135,000	.00568	.00029	.....	.....	
1,372	140,000	.00599	.00031	.....	.....	
1,421	145,000	.00629	.00030	.....	.....	
1,470	150,000	.00662	.00033	.....	.....	
1,519	155,000	.00699	.00037	.....	.....	
1,568	160,000	.00737	.00038	.....	.....	
1,617	165,000	.00772	.00035	.....	.....	Elastic limit.
1,666	170,000	.00814	.00042	.....	.....	
1,715	175,000	.00859	.00045	.....	.....	
1,764	180,000	.00907	.00048	.....	.....	
1,813	185,000	.00958	.00051	.....	.....	
1,862	190,000	.01020	.00062	.....	.....	
1,911	195,000	.01089	.00069	.....	.....	
1,960	200,000	.01170	.00081	.....	.....	
2,009	205,000	.012	.00130	.....	.....	
2,058	210,000	.014	.001	.....	.....	
2,107	215,000	.016	.002	.....	.....	Tensile strength.
2,156	220,000	.021	.005	.....	.....	
2,176	222,040	.024	.003	.....	.....	

*General summary.*

Tensile strength, per square inch of original section.....pounds.. 222,040  
 Elastic limit per square inch of original section.....do... 165,000  
 Elongation per inch after rupture.....inch... .014  
 Elongation per inch under strain at elastic limit.....do... .00772  
 Reduction in area after rupture, per centum of original section.....34.7  
 Position of rupture.....near middle of gauged section  
 Character of broken surface.....fine silky

No. 3148.

Sectional area,  $''\cdot0994 \times ''\cdot0994 = .0098$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
196	20,000	.00063	.00063	.....	.....	
392	40,000	.00148	.00085	.....	.....	
588	60,000	.00223	.00075	.....	.....	
784	80,000	.00312	.00089	.....	.....	
980	100,000	.00398	.00086	.....	.....	
1,029	105,000	.00418	.00020	.....	.....	
1,078	110,000	.00442	.00024	.....	.....	
1,127	115,000	.00467	.00025	.....	.....	
1,176	120,000	.00491	.00024	.....	.....	
1,225	125,000	.00517	.00026	.....	.....	
1,274	130,000	.00542	.00025	.....	.....	
1,323	135,000	.00572	.00030	.....	.....	
1,372	140,000	.00597	.00025	.....	.....	
1,421	145,000	.00622	.00025	.....	.....	
1,470	150,000	.00655	.00033	.....	.....	
1,519	155,000	.00683	.00028	.....	.....	
1,568	160,000	.00717	.00034	.....	.....	
1,617	165,000	.00749	.00032	.....	.....	
1,666	170,000	.00784	.00035	.....	.....	
1,715	175,000	.00822	.00031	.....	.....	Elastic limit.
1,764	180,000	.00866	.00044	.....	.....	
1,813	185,000	.00914	.00048	.....	.....	
1,862	190,000	.00966	.00052	.....	.....	
1,911	195,000	.01038	.00072	.....	.....	
1,960	200,000	.01127	.00089	.....	.....	
2,009	205,000	.012	.00073	.....	.....	
2,058	210,000	.014	.002	.....	.....	
2,107	215,000	.015	.001	.....	.....	
2,156	220,000	.020	.005	.....	.....	Tensile strength.
2,167	221,120	.026	.006	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 221,120  
 Elastic limit, per square inch of original section ..... do.. 175,000  
 Elongation per inch after rupture ..... inch.. .008  
 Elongation per inch under strain at elastic limit ..... do... .00822  
 Reduction in area after rupture, per centum of original section ..... 42.9  
 Position of rupture ..... 1''.85 outside the gauged section  
 Character of broken surface ..... fine, silky



Coil No. 2. Weight 51 pounds.

".10 SQUARE WIRE.

No. 3149.\*

Section area,  $".0991 \times ".0991 = .0098$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
0	5,000	0.	0.	0.	0.	
196	20,000	.00068	.00068	.....	.....	
392	40,000	.00143	.00075	.....	.....	
588	60,000	.00222	.00079	.....	.....	
784	80,000	.00307	.00085	.....	.....	
980	100,000	.00394	.00087	.....	.....	
1,029	105,000	.00415	.00021	.....	.....	
1,078	110,000	.00437	.00022	.....	.....	
1,127	115,000	.00464	.00027	.....	.....	
1,176	120,000	.00489	.00025	.....	.....	
1,225	125,000	.00517	.00023	.....	.....	
1,274	130,000	.00547	.00030	.....	.....	
1,323	135,000	.00574	.00027	.....	.....	
1,372	140,000	.00606	.00032	.....	.....	
1,421	145,000	.00637	.00031	.....	.....	
1,470	150,000	.00668	.00031	.....	.....	
1,519	155,000	.00708	.00040	.....	.....	
1,568	160,000	.00743	.00035	.....	.....	
1,617	165,000	.00781	.00038	.....	.....	Elastic limit.
1,666	170,000	.00822	.00041	.....	.....	
1,715	175,000	.00872	.00050	.....	.....	
1,764	180,000	.00922	.00050	.....	.....	
1,813	185,000	.00978	.00056	.....	.....	
1,862	190,000	.01050	.00072	.....	.....	
1,911	195,000	.01127	.00077	.....	.....	Tensile strength.
1,960	200,000	.01227	.00100	.....	.....	
2,009	205,000	.013	.00073	.....	.....	
2,058	210,000	.015	.001	.....	.....	
2,107	215,000	.019	.004	.....	.....	
2,142	218,570	.025	.006	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 218,570  
 Elastic limit per square inch of original section.....do... 165,000  
 Elongation per inch after rupture.....inch . . .013  
 Elongation per inch under strain at elastic limit.....do... .00781  
 Reduction in area after rupture, per centum of original section.....29.6  
 Position of rupture.....".65 inside the gauged section  
 Character of broken surface.....fine silky

No. 3150.

Sectional area,  $''\text{.0988} \times ''\text{.0988} = ''\text{.0097}$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00067	.00067	.....	.....	
388	40,000	.00145	.00078	.....	.....	
582	60,000	.00222	.00077	.....	.....	
776	80,000	.00307	.00085	.....	.....	
970	100,000	.00398	.00091	.....	.....	
1,018	105,000	.00414	.00016	.....	.....	
1,067	110,000	.00440	.00026	.....	.....	
1,115	115,000	.00467	.00027	.....	.....	
1,164	120,000	.00494	.00027	.....	.....	
1,212	125,000	.00522	.00028	.....	.....	
1,261	130,000	.00550	.00028	.....	.....	
1,309	135,000	.00577	.00027	.....	.....	
1,358	140,000	.00604	.00027	.....	.....	
1,406	145,000	.00638	.00034	.....	.....	
1,455	150,000	.00670	.00032	.....	.....	Elastic limit.
1,503	155,000	.00707	.00037	.....	.....	
1,552	160,000	.00740	.00033	.....	.....	
1,600	165,000	.00777	.00037	.....	.....	
1,649	170,000	.00817	.00040	.....	.....	
1,697	175,000	.00868	.00051	.....	.....	
1,746	180,000	.00948	.00080	.....	.....	
1,794	185,000	.00990	.00042	.....	.....	
1,843	190,000	.01058	.00068	.....	.....	
1,891	195,000	.01150	.00092	.....	.....	
1,940	200,000	.01265	.00115	.....	.....	
1,988	205,000	.014	.00135	.....	.....	
2,037	210,000	.015	.001	.....	.....	
2,085	215,000	.019	.004	.....	.....	
2,112	217,730	.026	.007	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 217,730  
 Elastic limit per square inch of original section.....do... 165,000  
 Elongation per inch after rupture.....inch... .017  
 Elongation per inch under strain at elastic limit.....do... .00777  
 Reduction in area after rupture, per centum of original section.....28.9  
 Position of rupture.....2'' .5 inside the gauged section  
 Character of broken surface.....fine silky

## No. 3151.

Sectional area  $''\cdot0989 \times ''\cdot0987 = \cdot0097$  square inch.  
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
48	5,000	0.	0.	0.	0.	Initial load.
194	20,000	.00068	.00068	.....	.....	
388	40,000	.00143	.00075	.....	.....	
582	60,000	.00222	.00079	.....	.....	
776	80,000	.00302	.00080	.....	.....	
970	100,000	.00392	.00090	.....	.....	
1,018	105,000	.00411	.00019	.....	.....	
1,067	110,000	.00432	.00021	.....	.....	
1,115	115,000	.00461	.00029	.....	.....	
1,164	120,000	.00486	.00025	.....	.....	
1,212	125,000	.00512	.00026	.....	.....	
1,261	130,000	.00542	.00030	.....	.....	
1,309	135,000	.00567	.00025	.....	.....	
1,358	140,000	.00599	.00032	.....	.....	
1,406	145,000	.00627	.00028	.....	.....	
1,455	150,000	.00668	.00041	.....	.....	
1,503	155,000	.00701	.00033	.....	.....	
1,552	160,000	.00737	.00036	.....	.....	
1,600	165,000	.00772	.00035	.....	.....	Elastic limit.
1,649	170,000	.00818	.00041	.....	.....	
1,697	175,000	.00861	.00048	.....	.....	
1,746	180,000	.00915	.00051	.....	.....	
1,794	185,000	.00972	.00057	.....	.....	
1,843	190,000	.01048	.00076	.....	.....	
1,891	195,000	.01123	.00075	.....	.....	
1,940	200,000	.01246	.00123	.....	.....	
1,988	205,000	.014	.00154	.....	.....	
2,037	210,000	.016	.002	.....	.....	
2,085	215,000	.018	.002	.....	.....	Tensile strength.
2,128	219,380	.021	.003	.....	.....	

*General summary.*

Tensile strength, per square inch of original section.....pounds.. 219,380  
 Elastic limit per square inch of original section.....do... 165,000  
 Elongation per inch after rupture.....inch... .011  
 Elongation per inch under strain at elastic limit.....do... .00772  
 Reduction in area after rupture, per centum of original section.....25.8  
 Position of rupture.....at one extremity of gauged section  
 Character of broken surface.....fine silky

*Coil No. 3. Weight, 50 pounds.*

## FLAT WIRE.

No. 3152.

Sectional area,  $".1490 \times ".0744 = .011$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00062	.00062	.....	.....	
440	40,000	.00136	.00074	.....	.....	
660	60,000	.00210	.00074	.....	.....	
880	80,000	.00295	.00085	.....	.....	
1,100	100,000	.00380	.00085	.....	.....	
1,155	105,000	.00403	.00023	.....	.....	
1,210	110,000	.00425	.00022	.....	.....	
1,265	115,000	.00448	.00023	.....	.....	
1,320	120,000	.00471	.00023	.....	.....	
1,375	125,000	.00496	.00025	.....	.....	
1,430	130,000	.00523	.00027	.....	.....	
1,485	135,000	.00545	.00022	.....	.....	
1,540	140,000	.00570	.00025	.....	.....	
1,595	145,000	.00595	.00025	.....	.....	
1,650	150,000	.00623	.00028	.....	.....	
1,705	155,000	.00651	.00028	.....	.....	
1,760	160,000	.00681	.00030	.....	.....	
1,815	165,000	.00707	.00026	.....	.....	
1,870	170,000	.00741	.00034	.....	.....	
1,925	175,000	.00773	.00032	.....	.....	
1,980	180,000	.00810	.00037	.....	.....	
2,035	185,000	.00846	.00036	.....	.....	Elastic limit.
2,090	190,000	.00903	.00057	.....	.....	
2,145	195,000	.00963	.00060	.....	.....	
2,210	200,000	.01040	.00077	.....	.....	
2,255	205,000	.01110	.00070	.....	.....	
2,310	210,000	.01260	.00150	.....	.....	
2,365	215,000	.015	.00240	.....	.....	
2,420	220,000	.017	.002	.....	.....	
2,475	225,000	.020	.003	.....	.....	
2,512	228,360	.025	.005	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 228,360  
 Elastic limit per square inch of original section.....do... 185,000  
 Elongation per inch after rupture.....inch... .014  
 Elongation per inch under strain at elastic limit.....do... .00846  
 Reduction in area after rupture, per centum of original section.....do... 29.1  
 Position of rupture.....2".5 inside the gauged section  
 Character of broken surface.....fine silky

No. 3153.

Sectional area,  $".1490 \times ".0744 = .011$  square inch.  
 Gauged length,  $10''$ .

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00068	.00068	.....	.....	
440	40,000	.00139	.00071	.....	.....	
660	60,000	.00212	.00073	.....	.....	
880	80,000	.00292	.00080	.....	.....	
1,100	100,000	.00378	.00086	.....	.....	
1,155	105,000	.00399	.00021	.....	.....	
1,210	110,000	.00422	.00023	.....	.....	
1,265	115,000	.00445	.00023	.....	.....	
1,320	120,000	.00469	.00024	.....	.....	
1,375	125,000	.00495	.00026	.....	.....	
1,430	130,000	.00519	.00024	.....	.....	
1,485	135,000	.00544	.00025	.....	.....	
1,540	140,000	.00569	.00025	.....	.....	
1,595	145,000	.00594	.00025	.....	.....	
1,650	150,000	.00624	.00030	.....	.....	
1,705	155,000	.00650	.00026	.....	.....	
1,760	160,000	.00679	.00029	.....	.....	
1,815	165,000	.00709	.00030	.....	.....	
1,870	170,000	.00742	.00033	.....	.....	
1,925	175,000	.00775	.00033	.....	.....	Elastic limit.
1,980	180,000	.00809	.00034	.....	.....	
2,035	185,000	.00845	.00036	.....	.....	
2,090	190,000	.00889	.00044	.....	.....	
2,145	195,000	.00947	.00056	.....	.....	
2,200	200,000	.01005	.00060	.....	.....	
2,255	205,000	.01088	.00083	.....	.....	
2,310	210,000	.01210	.00122	.....	.....	
2,365	215,000	.014	.00190	.....	.....	
2,420	220,000	.016	.002	.....	.....	Tensile strength.
2,475	225,000	.018	.002	.....	.....	
2,530	230,000	.023	.005	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 230,000  
 Elastic limit per square inch of original section .....do... 185,000  
 Elongation per inch after rupture .....inch... .006  
 Elongation per inch under strain at elastic limit .....do... .00845  
 Reduction in area after rupture, per centum of original section ..... 32.7  
 Position of rupture .....8".25 outside the gauged section  
 Character of broken surface .....fine silky

No. 3154.

Sectional area,  $".1490 \times ".0744 = .011$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00072	.00072	.....	.....	
440	40,000	.00147	.00075	.....	.....	
660	60,000	.00222	.00075	.....	.....	
880	80,000	.00307	.00085	.....	.....	
1,100	100,000	.00393	.00086	.....	.....	
1,155	105,000	.00415	.00022	.....	.....	
1,210	110,000	.00437	.00022	.....	.....	
1,265	115,000	.00462	.00025	.....	.....	
1,320	120,000	.00487	.00025	.....	.....	
1,375	125,000	.00512	.00025	.....	.....	
1,430	130,000	.00537	.00025	.....	.....	
1,485	135,000	.00562	.00025	.....	.....	
1,540	140,000	.00587	.00027	.....	.....	
1,595	145,000	.00611	.00024	.....	.....	
1,650	150,000	.00638	.00027	.....	.....	
1,705	155,000	.00668	.00030	.....	.....	
1,760	160,000	.00693	.00025	.....	.....	
1,815	165,000	.00727	.00034	.....	.....	
1,870	170,000	.00757	.00030	.....	.....	
1,925	175,000	.00786	.00029	.....	.....	Elastic limit.
1,980	180,000	.00821	.00035	.....	.....	
2,035	185,000	.00860	.00039	.....	.....	
2,090	190,000	.00908	.00048	.....	.....	
2,145	195,000	.00961	.00053	.....	.....	
2,200	200,000	.01037	.00076	.....	.....	
2,255	205,000	.01120	.00083	.....	.....	
2,310	210,000	.01250	.00130	.....	.....	
2,365	215,000	.014	.00150	.....	.....	
2,420	220,000	.016	.002	.....	.....	Tensile strength.
2,475	225,000	.020	.004	.....	.....	
2,508	228,000	.027	.007	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 228,000  
 Elastic limit per square inch of original section .....do... 185,000  
 Elongation per inch after rupture .....inch.. .017  
 Elongation per inch under strain at elastic limit.....do... .00860  
 Reduction in area after rupture, per centum of original section..... 27.3  
 Position of rupture .....1" inside the gauged section  
 Character of broken surface .....fine silky

Coil No. 4. Weight 54 pounds.

## FLAT WIRE.

No. 3155.

Sectional area,  $1.1483 \times .0740 = .011$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00070	.00070	.....	.....	
440	40,000	.00142	.00072	.....	.....	
660	60,000	.00222	.00080	.....	.....	
880	80,000	.00303	.00081	.....	.....	
1,100	100,000	.00388	.00085	.....	.....	
1,155	105,000	.00410	.00022	.....	.....	
1,210	110,000	.00432	.00022	.....	.....	
1,265	115,000	.00453	.00021	.....	.....	
1,320	120,000	.00479	.00026	.....	.....	
1,375	125,000	.00500	.00021	.....	.....	
1,430	130,000	.00524	.00021	.....	.....	
1,485	135,000	.00548	.00024	.....	.....	
1,540	140,000	.00572	.00024	.....	.....	
1,595	145,000	.00598	.00026	.....	.....	
1,650	150,000	.00622	.00024	.....	.....	
1,705	155,000	.00648	.00026	.....	.....	
1,760	160,000	.00678	.00030	.....	.....	
1,815	165,000	.00708	.00030	.....	.....	
1,870	170,000	.00738	.00030	.....	.....	
1,925	175,000	.00771	.00033	.....	.....	Elastic limit.
1,980	180,000	.00808	.00037	.....	.....	
2,035	185,000	.00851	.00043	.....	.....	
2,090	190,000	.00911	.00060	.....	.....	
2,145	195,000	.00979	.00068	.....	.....	
2,200	200,000	.01062	.00083	.....	.....	
2,255	205,000	.01168	.00106	.....	.....	
2,310	210,000	.01322	.00154	.....	.....	
2,365	215,000	.015	.00178	.....	.....	
2,420	220,000	.019	.004	.....	.....	Tensile strength.
2,445	222,270	.022	.003	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 222,270  
 Elastic limit per square inch of original section ..... do... 180,000  
 Elongation per inch after rupture ..... inch... .007  
 Elongation per inch under strain at elastic limit ..... do... .00808  
 Reduction in area after rupture, per centum of original section ..... 29.1  
 Position of rupture ..... 1" 4 outside the gauged section  
 Character of broken surface ..... fine silky

No. 3156.

Sectional area,  $''1483 \times ''0740 = .011$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5, 000	0.	0.	0.	0.	
220	20, 000	.00062	.00062	.....	.....	
440	40, 000	.00137	.00075	.....	.....	
660	60, 000	.00212	.00075	.....	.....	
880	80, 000	.00295	.00083	.....	.....	
1100	100, 000	.00381	.00086	.....	.....	
1155	105, 000	.00408	.00027	.....	.....	
1210	110, 000	.00430	.00022	.....	.....	
1265	115, 000	.00450	.00020	.....	.....	
1320	120, 000	.00471	.00021	.....	.....	
1375	125, 000	.00498	.00027	.....	.....	
1430	130, 000	.00522	.00024	.....	.....	
1485	135, 000	.00548	.00026	.....	.....	
1540	140, 000	.00576	.00028	.....	.....	
1595	145, 000	.00600	.00024	.....	.....	
1650	150, 000	.00628	.00028	.....	.....	
1705	155, 000	.00658	.00030	.....	.....	Elastic limit.
1760	160, 000	.00690	.00032	.....	.....	
1815	165, 000	.00723	.00033	.....	.....	
1870	170, 000	.00758	.00035	.....	.....	
1925	175, 000	.00800	.00042	.....	.....	
1980	180, 000	.00846	.00046	.....	.....	
2035	185, 000	.00898	.00052	.....	.....	
2090	190, 000	.00953	.00055	.....	.....	
2145	195, 000	.01033	.00080	.....	.....	
2200	200, 000	.01149	.00116	.....	.....	
2255	205, 000	.01250	.00101	.....	.....	Tensile strength.
2310	210, 000	.015	.00250	.....	.....	
2365	215, 000	.019	.004	.....	.....	
2412	219, 270	.023	.004	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 219, 270  
 Elastic limit per square inch of original section ..... do... 170, 000  
 Elongation per inch after rupture ..... inch... .007  
 Elongation per inch under strain at elastic limit ..... do... .00758  
 Reduction in area after rupture, per centum of original section ..... 26.4  
 Position of rupture ..... 5''5 outside the gauged section  
 Character of broken surface ..... fine silky



No. 3157.

Sectional area,  $".1483 \times ".0740 = .011$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00071	.00071	.....	.....	
440	40,000	.00148	.00077	.....	.....	
660	60,000	.00228	.00080	.....	.....	
880	80,000	.00308	.00080	.....	.....	
1,100	100,000	.00391	.00083	.....	.....	
1,155	105,000	.00412	.00021	.....	.....	
1,210	110,000	.00433	.00021	.....	.....	
1,265	115,000	.00458	.00025	.....	.....	
1,320	120,000	.00483	.00025	.....	.....	
1,375	125,000	.00507	.00024	.....	.....	
1,430	130,000	.00532	.00025	.....	.....	
1,485	135,000	.00558	.00026	.....	.....	
1,540	140,000	.00585	.00027	.....	.....	
1,595	145,000	.00613	.00028	.....	.....	
1,650	150,000	.00640	.00027	.....	.....	
1,705	155,000	.00675	.00035	.....	.....	
1,760	160,000	.00708	.00033	.....	.....	
1,815	165,000	.00740	.00032	.....	.....	
1,870	170,000	.00776	.00036	.....	.....	
1,925	175,000	.00817	.00041	.....	.....	Elastic limit.
1,980	180,000	.00861	.00044	.....	.....	
2,035	185,000	.00905	.00044	.....	.....	
2,090	190,000	.00968	.00063	.....	.....	
2,145	195,000	.01043	.00075	.....	.....	
2,200	200,000	.01122	.00079	.....	.....	
2,255	205,000	.01238	.00116	.....	.....	
2,310	210,000	.014	.00162	.....	.....	
2,365	215,000	.016	.002	.....	.....	
2,420	220,000	.021	.005	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 220,000  
 Elastic limit per square inch of original section.....do .. 170,000  
 Elongation per inch after rupture.....inch.. .009  
 Elongation per inch under strain at elastic limit.....do .. .00776  
 Reduction in area after rupture, per centum of original section.....34.5  
 Position of rupture.....1".15 outside the gauged section  
 Character of broken surface.....fine silky

## SECOND LOT.

## Coil No. 1.

## ".15 SQUARE WIRE.

No. 3386.

Sectional area,  $".1474 \times ".1474 = .0217$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
108	5,000	0.	0.	0.	0.	Initial load.
434	20,000	.00059	.00059	.....	.....	
868	40,000	.00138	.00070	.....	.....	
1,302	60,000	.00221	.00083	.....	.....	
1,736	80,000	.00313	.00092	.....	.....	
2,170	100,000	.00418	.00105	.....	.....	
2,278	105,000	.00446	.00028	.....	.....	
2,387	110,000	.00471	.00025	.....	.....	
2,495	115,000	.00503	.00032	.....	.....	
2,604	120,000	.00536	.00033	.....	.....	
2,712	125,000	.00568	.00032	.....	.....	Elastic limit.
2,821	130,000	.00609	.00041	.....	.....	
2,929	135,000	.00646	.00037	.....	.....	
3,038	140,000	.00688	.0.042	.....	.....	
3,146	145,000	.00733	.00045	.....	.....	
3,255	150,000	.00788	.00055	.....	.....	
3,363	155,000	.00851	.00063	.....	.....	
3,472	160,000	.00933	.00082	.....	.....	
3,580	165,000	.01046	.00113	.....	.....	
3,689	170,000	.013	.00254	.....	.....	
3,797	175,000	.016	.003	.....	.....	Tensile strength.
3,906	180,000	.019	.003	.....	.....	
4,006	184,610	.027	.008	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 184,610  
 Elastic limit per square inch of original section ..... do... 135,000  
 Elongation per inch after rupture. .... inch.. .0 2  
 Elongation per inch under strain at elastic limit ..... do... .00646  
 Reduction in area after rupture, per centum of original section ..... 30.4  
 Position of rupture. ....  $\frac{1}{8}$ " inside the gauged section  
 Character of broken surface. .... silky

No. 3387.

Sectional area,  $".1472 \times ".1472 = .0217$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
108	5,000	0.	0.	0.	0.	Initial load.
434	20,000	.00061	.00061	.....	.....	
888	40,000	.00138	.00077	.....	.....	
1,302	60,000	.00227	.00089	.....	.....	
1,736	80,000	.00320	.00093	.....	.....	
2,170	100,000	.00420	.00100	.....	.....	
2,272	105,000	.00440	.00020	.....	.....	
2,387	110,000	.00470	.00030	.....	.....	
2,495	115,000	.00497	.00027	.....	.....	
2,604	120,000	.00527	.00030	.....	.....	
2,712	125,000	.00557	.00030	.....	.....	
2,821	130,000	.00590	.00033	.....	.....	
2,927	135,000	.00622	.00032	.....	.....	
3,038	140,000	.00660	.00038	.....	.....	Elastic limit.
3,146	145,000	.00703	.00043	.....	.....	
3,255	150,000	.00749	.00046	.....	.....	
3,363	155,000	.00807	.00058	.....	.....	
3,472	160,000	.00880	.00073	.....	.....	
3,580	165,000	.00985	.00105	.....	.....	
3,689	170,000	.0115	.00165	.....	.....	
3,797	175,000	.013	.0015	.....	.....	
3,906	180,000	.017	.004	.....	.....	
4,016	185,000	.022	.005	.....	.....	Tensile strength.
4,048	186,540	.027	.005	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 186,540  
 Elastic limit per square inch of original section ..... do... 140,000  
 Elongation per inch after rupture ..... inch... .018  
 Elongation per inch under strain at elastic limit..... do... .00660  
 Reduction in area after rupture, per centum of original section..... 32.8  
 Position of rupture .....  $\frac{1}{2}$ " inside the gauged section  
 Character of broken surface ..... silky

No. 3388.

Sectional area  $".1472 \times ".1474 = .0217$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
108	5,000	0.	0.	0.	0.	Initial load.
434	20,000	.00069	.00069	.....	.....	
868	40,000	.00148	.00079	.....	.....	
1,302	60,000	.00232	.00084	.....	.....	
1,736	80,000	.00322	.00090	.....	.....	
2,170	100,000	.00433	.00111	.....	.....	
2,278	105,000	.00463	.00030	.....	.....	
2,387	110,000	.00500	.00037	.....	.....	
2,495	115,000	.00532	.00032	.....	.....	
2,604	120,000	.00572	.00040	.....	.....	Elastic limit.
2,712	125,000	.00616	.00044	.....	.....	
2,821	130,000	.00663	.00047	.....	.....	
2,927	135,000	.00710	.00047	.....	.....	
3,038	140,000	.00763	.00100	.....	.....	
3,146	145,000	.00828	.00065	.....	.....	
3,255	150,000	.00894	.00066	.....	.....	
3,363	155,000	.00982	.00088	.....	.....	
3,472	160,000	.01090	.00108	.....	.....	
3,580	165,000	.013	.00210	.....	.....	
3,689	170,000	.015	.003	.....	.....	Tensile strength.
3,797	175,000	.018	.002	.....	.....	
3,906	180,000	.022	.004	.....	.....	
3,997	184,190	.033	.011	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds. 184,160  
 Elastic limit per square inch of original section ..... do. 120,000  
 Elongation per inch after rupture ..... inch. .030  
 Elongation per inch under strain at elastic limit ..... do. .00572  
 Reduction in area after rupture, per centum of original section ..... 31.3  
 Position of rupture ..... 4."2 inside the gauged section  
 Character of broken surface ..... silky

## Coil 2.

Flat wire, ".1492 × ".0741 = .011 square inch.

No. 3389.

Sectional area, ".1492 × ".0741 = .011 square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00050	.00050	.....	.....	
440	40,000	.00124	.00074	.....	.....	
660	60,000	.00204	.00080	.....	.....	
880	80,000	.00280	.00086	.....	.....	
1,100	100,000	.00380	.00090	.....	.....	
1,355	105,000	.00400	.00020	.....	.....	
1,610	110,000	.00423	.00023	.....	.....	
1,865	115,000	.00449	.00026	.....	.....	
2,120	120,000	.00475	.00026	.....	.....	
2,375	125,000	.00500	.00025	.....	.....	
2,630	130,000	.00530	.00030	.....	.....	
2,885	135,000	.00555	.00025	.....	.....	
3,140	140,000	.00590	.00035	.....	.....	
3,395	145,000	.00618	.00028	.....	.....	
3,650	150,000	.00650	.00032	.....	.....	Elastic limit.
3,905	155,000	.00682	.00032	.....	.....	
4,160	160,000	.00720	.00038	.....	.....	
4,415	165,000	.00765	.00045	.....	.....	
4,670	170,000	.00820	.00055	.....	.....	
4,925	175,000	.00900	.00080	.....	.....	
5,180	180,000	.01015	.00115	.....	.....	
5,435	185,000	.012	.00185	.....	.....	
5,690	190,000	.016	.004	.....	.....	
5,945	195,000	.020	.004	.....	.....	
6,200	198,000	.027	.007	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 198,000  
 Elastic limit per square inch of original section.....do... 160,000  
 Elongation per inch after rupture.....inch... .010  
 Elongation per inch under strain at elastic limit.....do... .00720  
 Reduction in area after rupture, per centum of original section.....20.0  
 Position of rupture.....9".75 outside the gauged section, in holder jaws  
 Character of broken surface.....fine silky

## No. 3390.

Sectional area,  $".1492 \times ".0743 = .011$  per square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,080	0.	0.	0.	0.	Initial load.
220	20,000	.00050	.00050	.....	.....	
440	40,000	.00130	.00080	.....	.....	
660	60,000	.00210	.00080	.....	.....	
880	80,000	.00310	.00100	.....	.....	
1,100	100,000	.00405	.00095	.....	.....	
1,155	105,000	.00425	.00020	.....	.....	
1,210	110,000	.00457	.00032	.....	.....	
1,265	115,000	.00483	.00026	.....	.....	
1,320	120,000	.00519	.00036	.....	.....	
1,375	125,000	.00548	.00029	.....	.....	
1,430	130,000	.00588	.00040	.....	.....	
1,485	135,000	.00622	.00034	.....	.....	
1,540	140,000	.00667	.00045	.....	.....	
1,595	145,000	.00708	.00041	.....	.....	Elastic limit.
1,650	150,000	.00758	.00050	.....	.....	
1,705	155,000	.00808	.00050	.....	.....	
1,760	160,000	.00877	.00069	.....	.....	
1,815	165,000	.00948	.00071	.....	.....	
1,870	170,000	.01039	.00091	.....	.....	
1,925	175,000	.012	.00161	.....	.....	
1,980	180,000	.014	.002	.....	.....	
2,035	185,000	.016	.002	.....	.....	
2,090	190,000	.021	.005	.....	.....	Tensile strength.
2,118	192,540	.023	.002	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 192,540  
 Elastic limit per square inch of original section.....do... 145,000  
 Elongation per inch after rupture.....inch... .011  
 Elongation per inch under strain at elastic limit.....do... .00708  
 Reduction in area after rupture, per centum of original section..... 27.3  
 Position of rupture.....1".2 outside the gauged section  
 Character of broken surface.....silky

No. 3391.

Sectional area,  $".1493 \times ".0743 = .011$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00060	.00060	.....	.....	
440	40,000	.00136	.00076	.....	.....	
660	60,000	.00212	.00076	.....	.....	
880	80,000	.00298	.00086	.....	.....	
1,100	100,000	.00390	.00092	.....	.....	
1,155	105,000	.00412	.00022	.....	.....	
1,210	110,000	.00441	.00029	.....	.....	
1,265	115,000	.00466	.00025	.....	.....	
1,320	120,000	.00497	.00031	.....	.....	
1,375	125,000	.00519	.00022	.....	.....	
1,430	130,000	.00554	.00035	.....	.....	
1,485	135,000	.00584	.00030	.....	.....	
1,540	140,000	.00618	.00034	.....	.....	
1,595	145,000	.00649	.00031	.....	.....	
1,650	150,000	.00689	.00040	.....	.....	
1,705	155,000	.00731	.00042	.....	.....	
1,760	160,000	.00771	.00040	.....	.....	Elastic limit.
1,815	165,000	.00824	.00053	.....	.....	
1,870	170,000	.00895	.00071	.....	.....	
1,925	175,000	.00960	.00065	.....	.....	
1,980	180,000	.01060	.00100	.....	.....	
2,035	185,000	.012	.0014	.....	.....	Tensile strength.
2,090	186,000	.012	.001	.....	.....	
2,145	195,000	.016	.003	.....	.....	
2,168	197,090	.018	.002	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds .. 197,090  
 Elastic limit per square inch of original section ..... do .. 160,000  
 Elongation per inch after rupture ..... inch .. .003  
 Elongation per inch under strain at elastic limit ..... do .. .00771  
 Reduction in area after rupture, per centum of original section ..... 20.0  
 Position of rupture ..... 3".3 outside the gauged section  
 Character of broken surface ..... silky

## THIRD LOT.

The coils were marked 1, 2, and 3 when received, for identification.

*Marks on coils.*

Coil 1, no marks.

Coil 2, stock, S. M.; size,  $15 \times 9$ ; strength, 2290; torsion, 10.

Coil 3, stock, S. M.; size,  $15 \times 9$ ; strength, 2340; torsion, 15.

*Description.*

Number of coil.	Surface of wire.	Nominal dimensions.	Actual dimensions.		Weight of coil.		Diameter of curve of wires.	
			One end.	Other end.	Pounds.	Ounces.	In coil.	When released.
1	Tinned .	" "	" "	" "	55	-----	"	"
2	do . . . .	.15 $\times$ .075	.1491 $\times$ .0741	.1492 $\times$ .0742	28	8	17	42
3	do . . . .	.15 $\times$ .075	.1488 $\times$ .0730	.1486 $\times$ .0732	17	8	16	42
			.1486 $\times$ .0730	.1485 $\times$ .0726			16	48

The surfaces of the wires were smooth, and corners rounded to about ".01 radius.

In general, the tinning appears of uniform thickness. Each coil, however, showed places in which the coating was broken, exposing the steel in minute places.

There was excess of tin in places on the edges of coil No. 1, the thickness being in these places ".002 $\pm$ .

The wires coiled successfully over an arbor ".13 diameter.



## Coil No. 1.

No. 3763.

Sectional area,  $1.1490 \times .0742 = .011$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00070	.00070	.....	.....	
440	40,000	.00142	.00072	.....	.....	
660	60,000	.00220	.00078	.....	.....	
880	80,000	.00299	.00079	.....	.....	
1,100	100,000	.00377	.00078	.....	.....	
1,155	105,000	.00392	.00015	.....	.....	
1,210	110,000	.00411	.00019	.....	.....	
1,265	115,000	.00431	.00020	.....	.....	
1,320	120,000	.00451	.00020	.....	.....	
1,375	125,000	.00471	.00020	.....	.....	
1,430	130,000	.00491	.00020	.....	.....	
1,485	135,000	.00516	.00025	.....	.....	
1,540	140,000	.00538	.00022	.....	.....	
1,595	145,000	.00558	.00020	.....	.....	
1,650	150,000	.00581	.00023	.....	.....	
1,705	155,000	.00602	.00021	.....	.....	
1,760	160,000	.00630	.00028	.....	.....	
1,815	165,000	.00659	.00029	.....	.....	
1,870	170,000	.00694	.00035	.....	.....	
1,925	175,000	.00733	.00039	.....	.....	Elastic limit.
1,980	180,000	.00782	.00049	.....	.....	
2,035	185,000	.00860	.00078	.....	.....	
2,090	190,000	.00988	.00128	.....	.....	
2,145	195,000	.017	.00712	.....	.....	Tensile strength.
2,200	200,000	.027	.010	.....	.....	
2,209	200,820	.031	.004	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds. 200,820  
 Elastic limit per square inch of original section ..... do .. 175,000  
 Elongation per inch after rupture ..... inch: .020  
 Elongation per inch under strain at elastic limit ..... do... .00733  
 Reduction in area after rupture, per centum of original section ..... 32.8  
 Position of rupture ..... 1" .15 inside the gauged section  
 Character of broken surface ..... silky

## No. 3764.

Sectional area,  $''\cdot1490 \times ''\cdot0735 = .011$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00075	.00075	.....	.....	
440	40,000	.00152	.00077	.....	.....	
660	60,000	.00234	.00082	.....	.....	
880	80,000	.00307	.00073	.....	.....	
1,100	100,000	.00387	.00080	.....	.....	
1,155	105,000	.00407	.00020	.....	.....	
1,210	110,000	.00422	.00015	.....	.....	
1,265	115,000	.00447	.00025	.....	.....	
1,320	120,000	.00466	.00019	.....	.....	
1,375	125,000	.00486	.00020	.....	.....	
1,430	130,000	.00510	.00024	.....	.....	
1,485	135,000	.00531	.00021	.....	.....	
1,540	140,000	.00550	.00019	.....	.....	
1,595	145,000	.00579	.00029	.....	.....	
1,650	150,000	.00598	.00019	.....	.....	
1,705	155,000	.00622	.00024	.....	.....	
1,760	160,000	.00650	.00028	.....	.....	
1,815	165,000	.00678	.00028	.....	.....	
1,870	170,000	.00717	.00039	.....	.....	Elastic limit.
1,925	175,000	.00755	.00038	.....	.....	
1,980	180,000	.00806	.00051	.....	.....	
2,035	185,000	.00878	.00072	.....	.....	
2,090	190,000	.01002	.00124	.....	.....	Tensile strength.
2,145	195,000	.015	.00498	.....	.....	
2,200	200,000	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds . 200,000  
 Elastic limit per square inch of original section ..... do . 175,000  
 Elongation per inch after rupture ..... inch . .007  
 Elongation per inch under strain at elastic limit ..... do . .00755  
 Reduction in area after rupture, per centum of original section ..... 37.3  
 Position of rupture ..... 7''.35 outside the gauged section  
 Character of broken surface ..... fine silky

## No. 3765.

Sectional area,  $''\text{.1490} \times ''\text{.0740} = .011$  square inch.  
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	3,000	0.	0.	0.	0.	Initial load.
229	20,000	.00064	.00064	.....	.....	
440	40,000	.00137	.00073	.....	.....	
660	60,000	.00212	.00075	.....	.....	
880	80,000	.00292	.00080	.....	.....	
1,100	100,000	.00365	.00073	.....	.....	
1,320	120,000	.00428	.00063	.....	.....	
1,575	125,000	.00450	.00022	.....	.....	
1,430	130,000	.00488	.00038	.....	.....	
1,485	135,000	.00512	.00024	.....	.....	
1,540	140,000	.00531	.00019	.....	.....	
1,595	145,000	.00553	.00022	.....	.....	
1,650	150,000	.00577	.00024	.....	.....	
1,705	155,000	.00597	.00020	.....	.....	
1,760	160,000	.00623	.00028	.....	.....	
1,815	165,000	.00654	.00031	.....	.....	Elastic limit.
1,870	170,000	.00685	.00031	.....	.....	
1,925	175,000	.00726	.00041	.....	.....	
1,980	180,000	.00774	.00048	.....	.....	
2,035	185,000	.00837	.00063	.....	.....	
2,090	190,000	.00975	.00138	.....	.....	
2,145	195,000	.016	.00625	.....	.....	
2,200	200,000	.020	.004	.....	.....	
2,220	201,820	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds.. 201,820  
 Elastic limit per square inch of original section .....do... 170,000  
 Elongation per inch after rupture .....inch... .008  
 Elongation per inch under strain at elastic limit.....do... .00685  
 Reduction in area after rupture, per centum of original section..... 37.3  
 Position of rupture.....7''.5 outside the gauged section  
 Character of broken surface.....fine silky

*Coil No. 2.*

No. 3766.

Sectional area,  $''\text{.1490} \times ''\text{.0730} = .011$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00074	.00074	.....	.....	
440	40,000	.00149	.00075	.....	.....	
660	60,000	.00227	.00078	.....	.....	
880	80,000	.00307	.00080	.....	.....	
1,100	100,000	.00392	.00083	.....	.....	
1,320	120,000	.00468	.00076	.....	.....	
1,540	140,000	.00540	.00019	.....	.....	
1,760	160,000	.00642	.00025	.....	.....	
1,980	180,000	.00800	.00050	.....	.....	
2,200	200,000	.025	.008	.....	.....	
1,485	135,000	.00530	.00024	.....	.....	Elastic limit.
1,375	125,000	.00484	.00016	.....	.....	
1,430	130,000	.00506	.00022	.....	.....	
1,595	145,000	.00570	.00021	.....	.....	
1,650	150,000	.00595	.00025	.....	.....	
1,705	155,000	.00617	.00022	.....	.....	
1,815	165,000	.00671	.00029	.....	.....	
1,870	170,000	.00708	.00037	.....	.....	
1,925	175,000	.00750	.00042	.....	.....	
2,035	185,000	.00902	.00102	.....	.....	
2,090	190,000	.01080	.00178	.....	.....	Tensile strength.
2,145	195,000	.017	.00620	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 200,000  
 Elastic limit per square inch of original section ..... do... 170,000  
 Elongation per inch after rupture ..... inch.. .011  
 Elongation per inch under strain at elastic limit ..... do... .00708  
 Reduction in area after rupture, per centum of original section ..... 37.3  
 Position of rupture ..... 7'' 9 outside the gauged section  
 Character of broken surface ..... fine silky

No. 3767.

Sectional area,  $".1487 \times ".0730 = .011$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00076	.00076	.....	.....	
440	40,000	.00153	.00077	.....	.....	
660	60,000	.00230	.00077	.....	.....	
880	80,000	.00311	.00081	.....	.....	
1,100	100,000	.00392	.00081	.....	.....	
1,320	120,000	.00472	.00080	.....	.....	
1,540	140,000	.00554	.00081	.....	.....	
1,760	160,000	.00634	.00087	.....	.....	
1,980	180,000	.00707	.00087	.....	.....	
2,200	200,000	.017	.00643	.....	.....	
2,200	200,000	.....	.....	.....	.....	
1,980	180,000	.00801	.00057	.....	.....	Elastic limit.
1,760	160,000	.00647	.00023	.....	.....	
1,540	140,000	.00554	.00027	.....	.....	
1,320	120,000	.00472	.00080	.....	.....	Tensile strength.
1,100	100,000	.00392	.00081	.....	.....	
880	80,000	.00311	.00081	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 200,000  
 Elastic limit per square inch of original section.....do.. 175,000  
 Elongation per inch after rupture.....inch.. .009  
 Elongation per inch under strain at elastic limit.....do.. .00744  
 Reduction in area after rupture, per centum of original section.....35.5  
 Position of rupture.....9" outside the gauged section  
 Character of broken surface.....fine silky

No. 3768.

Sectional area,  $".1487 \times ".0730 = .011$  square inch.

Gauged length, 10"

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00069	.00069	.....	.....	
440	40,000	.00145	.00076	.....	.....	
660	60,000	.00218	.00073	.....	.....	
880	80,000	.00298	.00080	.....	.....	
1,100	100,000	.00377	.00079	.....	.....	
1,320	120,000	.00458	.00081	.....	.....	
1,375	125,000	.00478	.00020	.....	.....	
1,430	130,000	.00503	.00025	.....	.....	
1,485	135,000	.00522	.00019	.....	.....	
1,540	140,000	.00545	.00023	.....	.....	
1,595	145,000	.00567	.00022	.....	.....	
1,650	150,000	.00590	.00023	.....	.....	
1,705	155,000	.00612	.00022	.....	.....	
1,760	160,000	.00638	.00026	.....	.....	
1,815	165,000	.00668	.00030	.....	.....	Elastic limit.
1,870	170,000	.00704	.00036	.....	.....	
1,925	175,000	.00749	.00045	.....	.....	
1,980	180,000	.00806	.00057	.....	.....	
2,035	185,000	.00906	.00100	.....	.....	
2,090	190,000	.01076	.00170	.....	.....	
2,145	195,000	.015	.00424	.....	.....	
2,200	200,000	.022	.007	.....	.....	Tensile strength.
2,212	201,090	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 201,090  
 Elastic limit per square inch of original section ..... do .. 170,000  
 Elongation per inch after rupture ..... inch . .012  
 Elongation per inch under strain at elastic limit ..... do... .00704  
 Reduction in area after rupture, per centum of original section ..... 29.1  
 Position of rupture ..... ".75 outside the gauged section  
 Character of broken surface ..... fine silky

## Coil No. 3.

No. 3769.

Sectional area,  $".1484" \times .0728 = .0108$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
54	5,000	0.	0.	0.	0.	Initial load.
216	20,000	.00061	.00061	.....	.....	
432	40,000	.00141	.00080	.....	.....	
648	60,000	.00208	.00067	.....	.....	
864	80,000	.00284	.00076	.....	.....	
1,080	100,000	.00359	.00075	.....	.....	
1,296	120,000	.00444	.00085	.....	.....	
1,512	140,000	.00530	.00125	.....	.....	
1,728	160,000	.00685	.00061	.....	.....	
1,944	180,000	.023	.005	.....	.....	
2,160	200,000	.030	.007	.....	.....	Elastic limit.
2,376	220,000	.....	.....	.....	.....	
2,592	240,000	.....	.....	.....	.....	
2,808	260,000	.....	.....	.....	.....	
3,024	280,000	.....	.....	.....	.....	
3,240	300,000	.....	.....	.....	.....	
3,456	320,000	.....	.....	.....	.....	
3,672	340,000	.....	.....	.....	.....	
3,888	360,000	.....	.....	.....	.....	
4,104	380,000	.....	.....	.....	.....	
4,320	400,000	.....	.....	.....	.....	Tensile strength
4,536	420,000	.....	.....	.....	.....	
4,752	440,000	.....	.....	.....	.....	
4,968	460,000	.....	.....	.....	.....	
5,184	480,000	.....	.....	.....	.....	
5,400	500,000	.....	.....	.....	.....	
5,616	520,000	.....	.....	.....	.....	
5,832	540,000	.....	.....	.....	.....	
6,048	560,000	.....	.....	.....	.....	
6,264	580,000	.....	.....	.....	.....	

## General summary.

Tensile strength, per square inch of original section ..... pounds.. 188,700  
 Elastic limit, per square inch of original section ..... do... 155,000  
 Elongation per inch after rupture ..... inch... .026  
 Elongation per inch under strain at elastic limit ..... do... .00624  
 Reduction in area after rupture, per centum of original section ..... 36.1  
 Position of rupture ..... 2", 75 outside the gauged section  
 Character of broken surface ..... fine silky

H. Ex. 165—40

No. 3770.

Sectional area,  $".1484 \times ".0728 = .0108$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
54	5,000	0.	0.	0.	0.	Initial load.
216	20,000	.00072	.00072	.....	.....	
432	40,000	.00149	.00077	.....	.....	
648	60,000	.00227	.00078	.....	.....	
864	80,000	.00302	.00075	.....	.....	
1,080	100,000	.00379	.00077	.....	.....	
1,296	120,000	.00464	.00085	.....	.....	
1,360	125,000	.00483	.00019	.....	.....	
1,414	130,000	.00499	.00016	.....	.....	
1,458	135,000	.00522	.00023	.....	.....	
1,512	140,000	.00543	.00021	.....	.....	
1,566	145,000	.00563	.00020	.....	.....	
1,620	150,000	.00587	.00024	.....	.....	
1,674	155,000	.00612	.00025	.....	.....	
1,728	160,000	.00641	.00029	.....	.....	
1,782	165,000	.00663	.00022	.....	.....	
1,836	170,000	.00693	.00030	.....	.....	Elastic limit.
1,890	175,000	.00752	.00059	.....	.....	
1,944	180,000	.00812	.00060	.....	.....	
1,998	185,000	.00910	.00098	.....	.....	
2,052	190,000	.01100	.00190	.....	.....	
2,106	195,000	.016	.005	.....	.....	
2,160	200,000	.025	.009	.....	.....	
2,186	202,410	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 202,410  
 Elastic limit per square inch of original section ..... do... 170,000  
 Elongation per inch after rupture ..... inch... .018  
 Elongation per inch under strain at elastic limit ..... do... .00693  
 Reduction in area after rupture, per centum of original section ..... 28.7  
 Position of rupture ..... ".60 outside the gauged section  
 Character of broken surface ..... fine silky



No. 3771.

Sectional area,  $".1484 \times ".0728 = .0108$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
54	5,000	0.	0.	0.	0.	Initial load.
216	20,000	.00074	.00074	.....	.....	
432	40,000	.00137	.00063	.....	.....	
648	60,000	.00212	.00075	.....	.....	
864	80,000	.00293	.00081	.....	.....	
1,080	100,000	.00373	.00080	.....	.....	
1,296	120,000	.00456	.00083	.....	.....	
1,350	125,000	.00474	.00018	.....	.....	
1,404	130,000	.00493	.00019	.....	.....	
1,458	135,000	.00514	.00021	.....	.....	
1,512	140,000	.00534	.00020	.....	.....	
1,566	145,000	.00560	.00026	.....	.....	
1,620	150,000	.00581	.00021	.....	.....	
1,674	155,000	.00603	.00022	.....	.....	
1,728	160,000	.00627	.00024	.....	.....	
1,782	165,000	.00657	.00030	.....	.....	Elastic limit.
1,836	170,000	.00691	.00034	.....	.....	
1,890	175,000	.00739	.00048	.....	.....	
1,944	180,000	.00787	.00058	.....	.....	
1,998	185,000	.00833	.00096	.....	.....	
2,052	190,000	.01052	.00159	.....	.....	Tensile strength.
2,106	195,000	.016	.00548	.....	.....	
2,160	200,000	.023	.007	.....	.....	
2,192	202,960	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 202,960  
 Elastic limit per square inch of original section ..... do... 170,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do... .00691  
 Reduction in area after rupture, per centum of original section ..... 31.5  
 Position of rupture ..... ".80 inside the gauged length  
 Character of broken surface ..... fine silky

## FOURTH LOT.

*Description.*

Number of coil.	Surface of wire.	Nominal dimensions.	Actual dimensions.		Weight of coil.		Diameter of curve of wires.	
			Outside end.	Inside end.	Pounds.	Ounces.	In coil.	When released.
1	Tinned.	.15 × .15	.148 × .148	.148 × .148	25	.....	21	36
2	...do....	.15 × .15	.148 × .148	.148 × .148	27	8	21	41

The wires were trapezoidal in cross section. The maximum diameter of coil No. 1 was  $''\text{.1494} \pm$  the minimum diameter  $''\text{.1455} \pm$ .

For coil No. 2 the maximum and minimum diameters were  $''\text{.1486} \pm$  and  $''\text{.1460} \pm$  respectively.

The surfaces of the wires were generally smooth, and the corners rounded to about  $''\text{.01}$  radius.

The tinning covered the wires and appeared to be uniformly distributed, except at one end of coil No. 2, where there were naked places, and also places of excessive thickness of tin.

The samples coiled over an arbor the diameter of their diagonals without fracture.

*Marks on coils.*

No. 1. Strength, 4,705; torsion, 8.

No. 2. Strength, 4,560; torsion, 9.

## SAMPLES FROM COIL NO. 1.

No. 3847.

Sectional area,  $".148 \times ".148 = .0219$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch</i>	<i>Inch.</i>	
109	5,000	0.	0.	0.	0.	Initial load.
438	20,000	.00061	.00061	.....	.....	
876	40,000	.00129	.00068	.....	.....	
1,314	60,000	.00202	.00073	.....	.....	
1,752	80,000	.00279	.00077	.....	.....	
2,190	100,000	.00362	.00083	.....	.....	
2,628	120,000	.00448	.00086	.....	.....	
2,737	125,000	.00472	.00024	.....	.....	
2,847	130,000	.00496	.00024	.....	.....	
2,956	135,000	.00518	.00022	.....	.....	
3,066	140,000	.00543	.00025	.....	.....	
3,175	145,000	.00573	.00030	.....	.....	
3,285	150,000	.00598	.00025	.....	.....	
3,394	155,000	.00633	.00035	.....	.....	
3,504	160,000	.00668	.00035	.....	.....	
3,613	165,000	.00707	.00039	.....	.....	Elastic limit.
3,723	170,000	.00757	.00050	.....	.....	
3,832	175,000	.00810	.00053	.....	.....	
3,942	180,000	.00892	.00072	.....	.....	
4,051	185,000	.00982	.00090	.....	.....	
4,161	190,000	.01311	.00329	.....	.....	Tensile strength.
4,270	195,000	.016	.00289	.....	.....	
4,380	200,000	.021	.005	.....	.....	
4,489	205,000	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	205,000
Elastic limit per square inch of original section.....	do..	165,000
Elongation per inch after rupture.....	inch..	.022
Elongation per inch under strain at elastic limit.....	do..	.00707
Reduction in area after rupture, per centum of original section.....		34.2
Position of rupture.....	"	.60 inside the gauged section
Character of broken surface.....		fine silky

No. 3848.

Sectional area,  $".148 \times ".148 = .0219$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
109	5,000	0.	0.	0.	0.	
138	20,000	.00068	.00068	.....	.....	
876	40,000	.00133	.00065	.....	.....	
1,314	60,000	.00210	.00077	.....	.....	
1,752	80,000	.00290	.00080	.....	.....	
2,190	100,000	.00372	.00082	.....	.....	
2,628	120,000	.00460	.00082	.....	.....	
2,737	125,000	.00482	.00022	.....	.....	
2,847	130,000	.00507	.00025	.....	.....	
2,956	135,000	.00528	.00021	.....	.....	
3,066	140,000	.00551	.00023	.....	.....	
3,175	145,000	.00575	.00024	.....	.....	
3,285	150,000	.00602	.00027	.....	.....	
3,594	155,000	.00631	.00029	.....	.....	
3,504	160,000	.00608	.00037	.....	.....	Elastic limit.
3,613	165,000	.00707	.00039	.....	.....	
3,723	170,000	.00752	.00045	.....	.....	
3,832	175,000	.00810	.00058	.....	.....	
3,942	180,000	.00888	.00078	.....	.....	
4,051	185,000	.00980	.00092	.....	.....	Tensile strength.
4,161	190,000	.01146	.00166	.....	.....	
4,270	195,000	.016	.00454	.....	.....	
4,380	200,000	.018	.002	.....	.....	
4,470	204,110	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 204,110  
 Elastic limit per square inch of original section ..... do... 165,000  
 Elongation per inch after rupture ..... inch.. .022  
 Elongation per inch under strain at elastic limit ..... do... .00707  
 Reduction in area after rupture, per centum of original section ..... 34.2  
 Position of rupture ..... 1."70 inside the gauged section  
 Character of broken surface ..... fine silky

No. 3849.

Sectional area,  $".148 \times ".148 = .0219$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
109	5,000	0.	0.	0.	0.	
438	20,000	.00066	.00066	.....	.....	
870	40,000	.00138	.00072	.....	.....	
1,314	60,000	.00216	.00082	.....	.....	
1,752	80,000	.00290	.00074	.....	.....	
2,190	100,000	.00372	.00082	.....	.....	
2,628	120,000	.00461	.00089	.....	.....	
2,787	125,000	.00478	.00017	.....	.....	
2,847	130,000	.00502	.00024	.....	.....	
2,956	135,000	.00523	.00021	.....	.....	
3,066	140,000	.00548	.00025	.....	.....	
3,175	145,000	.00570	.00022	.....	.....	
3,285	150,000	.00594	.00024	.....	.....	
3,394	155,000	.00618	.00024	.....	.....	
3,504	160,000	.00651	.00033	.....	.....	
3,613	165,000	.00682	.00031	.....	.....	
3,723	170,000	.00719	.00037	.....	.....	Elastic limit.
3,832	175,000	.00767	.00048	.....	.....	
3,942	180,000	.00820	.00053	.....	.....	
4,051	185,000	.00897	.00077	.....	.....	
4,161	190,000	.00997	.00100	.....	.....	
4,270	195,000	.01130	.00133	.....	.....	
4,380	200,000	.014	.00270	.....	.....	
4,489	205,000	.017	.003	.....	.....	Tensile strength.
4,566	208,490	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds...208,490  
 Elastic limit per square inch of original section.....do...170,000  
 Elongation per inch after rupture.....inch... .012  
 Elongation per inch under strain at elastic limit.....do... .00719  
 Reduction in area after rupture, per centum of original section.....39.7  
 Position of rupture.....5".22 outside the gauged section  
 Character of broken surface.....fine silky

## SAMPLES FROM COIL NO. 2.

No. 3850.

Sectional area,  $''\text{.148} \times ''\text{.148} = .0219$  square inch.  
 Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
109	5,000	0.	0.	0.	0.	
438	20,000	.00060	.00060	.....	.....	
876	40,000	.00128	.00068	.....	.....	
1,314	60,000	.00205	.00077	.....	.....	
1,752	80,000	.00277	.00072	.....	.....	
2,190	100,000	.00362	.00085	.....	.....	
2,628	120,000	.00445	.00083	.....	.....	
2,737	125,000	.00464	.00019	.....	.....	
2,847	130,000	.00485	.00021	.....	.....	
2,956	135,000	.00509	.00024	.....	.....	
3,066	140,000	.00530	.00021	.....	.....	
3,175	145,000	.00554	.00024	.....	.....	
3,285	150,000	.00576	.00022	.....	.....	
3,394	155,000	.00600	.00024	.....	.....	
3,504	160,000	.00630	.00030	.....	.....	
3,613	165,000	.00660	.00030	.....	.....	
3,723	170,000	.00695	.00035	.....	.....	Elastic limit.
3,832	175,000	.00735	.00040	.....	.....	
3,942	180,000	.00779	.00044	.....	.....	
4,051	185,000	.00844	.00065	.....	.....	
4,161	190,000	.00905	.00061	.....	.....	
4,270	195,000	.01005	.00100	.....	.....	Tensile strength.
4,380	200,000	.01165	.00160	.....	.....	
4,489	205,000	.017	.00535	.....	.....	
4,599	210,000	.023	.006	.....	.....	
4,692	212,880	.....	.....	.....	.....	

## General summary.

Tensile strength, per square inch of original section.....	pounds..	212,880
Elastic limit per square inch of original section.....	do.....	170,000
Elongation per inch after rupture.....	inch..	.027
Elongation per inch under strain at elastic limit.....	do.....	.00695
Reduction in area after rupture, per centum of original section.....		39.7
Position of rupture.....	".75 inside the gauged section	
Character of broken surface.....	fine silky	

No. 3851.

Sectional area,  $''\text{.148} \times ''\text{.148} = \text{.0219}$  square inch.  
 Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
109	5,000	0.	0.	0.	0.	Initial load.
438	20,000	.00058	.00058	.....	.....	
876	40,000	.00128	.00070	.....	.....	
1,314	60,000	.00205	.00077	.....	.....	
1,752	80,000	.00282	.00077	.....	.....	
2,190	100,000	.00360	.00078	.....	.....	
2,628	120,000	.00445	.00085	.....	.....	
2,737	125,000	.00465	.00029	.....	.....	
2,847	130,000	.00486	.00021	.....	.....	
2,956	135,000	.00510	.00024	.....	.....	
3,066	140,000	.00530	.00020	.....	.....	
3,175	145,000	.00555	.00025	.....	.....	
3,285	150,000	.00578	.00023	.....	.....	
3,394	155,000	.00604	.00026	.....	.....	
3,504	160,000	.00630	.00026	.....	.....	
3,613	165,000	.00664	.00034	.....	.....	Elastic limit.
3,723	170,000	.00700	.00036	.....	.....	
3,832	175,000	.00737	.00037	.....	.....	
3,942	180,000	.00786	.00049	.....	.....	
4,051	185,000	.00842	.00056	.....	.....	
4,161	190,000	.00914	.00072	.....	.....	
4,270	195,000	.01003	.00089	.....	.....	
4,380	200,000	.01158	.00155	.....	.....	
4,489	205,000	.015	.00342	.....	.....	
4,599	210,000	.018	.003	.....	.....	
4,640	211,870	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 211,870  
 Elastic limit per square inch of original section ..... do... 175,000  
 Elongation per inch after rupture ..... inch... .012  
 Elongation per inch under strain at elastic limit ..... do... .00737  
 Reduction in area after rupture, per centum of original section ..... 34.2  
 Position of rupture ..... 1" outside the gauged section  
 Character of broken surface..... fine silky

No. 3852.

Sectional area,  $".148 \times ".148 = .0219$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
109	5,000	0.	0.	0.	0.	Initial load.
438	20,000	.00059	.00059	.....	.....	
876	40,000	.00138	.00079	.....	.....	
1,314	60,000	.00212	.00074	.....	.....	
1,752	80,000	.00295	.00083	.....	.....	
2,190	100,000	.00374	.00079	.....	.....	
2,628	120,000	.00458	.00084	.....	.....	
2,737	125,000	.00479	.00021	.....	.....	
2,847	130,000	.00500	.00021	.....	.....	
2,956	135,000	.00521	.00021	.....	.....	
3,066	140,000	.00544	.00023	.....	.....	Elastic limit.
3,175	145,000	.00564	.00020	.....	.....	
3,285	150,000	.00590	.00026	.....	.....	
3,394	155,000	.00617	.00027	.....	.....	
3,504	160,000	.00642	.00025	.....	.....	
3,613	165,000	.00672	.00030	.....	.....	
3,723	170,000	.00707	.00035	.....	.....	
3,832	175,000	.00748	.00041	.....	.....	
3,942	180,000	.00800	.00052	.....	.....	
4,051	185,000	.00838	.00038	.....	.....	
4,161	190,000	.00912	.00074	.....	.....	Tensile strength.
4,270	195,000	.00997	.00085	.....	.....	
4,380	200,000	.01137	.00140	.....	.....	
4,489	205,000	.016	.00463	.....	.....	
4,599	210,000	.019	.003	.....	.....	
4,640	211,870	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 211,870  
 Elastic limit per square inch of original section ..... do... 170,000  
 Elongation per inch after rupture ..... inch... .020  
 Elongation per inch under strain at elastic limit ..... do... .00707  
 Reduction in area after rupture, per centum of original section ..... 37.4  
 Position of rupture ..... 1".70 inside the gauged section  
 Character of broken surface ..... fine silky



## TABULATION OF SQUARE AND FLAT TINNED AND UNTINNED STEEL WIRE.

[From R. H. Wolf &amp; Co., Limited.]

## FIRST LOT.

No. of test.	Mark on coil.	Dimensions.		Sectional area.		Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Con- traction of area.	Appearance of fracture.	Remarks.
		Width.	Thick- ness.	Sq. in.	Pounds.	Per square inch.	Total.	Per square inch.	Total.	Inch.	P. ct.				
3146	1	.0994	.0994	.0098	1,583	160,000	2,148	210,150	.09	0.9	P. ct.	.080 X .080 = .0064	34.7	Fine silky	Not tinned.
3147	1	.0994	.0994	.0098	1,617	165,000	2,176	221,040	.14	1.4	P. ct.	.080 X .080 = .0064	34.7	do	
3148	1	.0994	.0994	.0098	1,715	175,000	2,167	221,120	.08	0.8	P. ct.	.075 X .075 = .0056	42.9	do	
3149	2	.0991	.0991	.0098	1,617	165,000	2,142	218,570	.13	1.3	P. ct.	.083 X .083 = .0069	29.6	do	
3150	2	.0988	.0988	.0097	1,600	165,000	2,112	217,730	.17	1.7	P. ct.	.083 X .083 = .0069	29.6	do	
3151	1	.0989	.0987	.0097	1,600	165,000	2,128	219,360	.11	1.1	P. ct.	.085 X .085 = .0072	25.8	do	
3152	3	.1490	.0744	.011	2,035	185,000	2,512	238,360	.14	1.4	P. ct.	.130 X .060 = .0078	29.1	do	
3153	3	.1490	.0744	.011	2,035	185,000	2,530	238,360	.06	0.6	P. ct.	.133 X .056 = .0074	32.7	do	
3154	3	.1490	.0744	.011	2,035	185,000	2,508	228,000	.17	1.7	P. ct.	.133 X .060 = .0080	27.3	do	
3155	4	.1483	.0740	.011	1,980	180,000	2,445	227,270	.07	0.7	P. ct.	.130 X .060 = .0081	29.1	do	
3156	4	.1483	.0740	.011	1,870	170,000	2,412	219,270	.07	0.7	P. ct.	.130 X .062 = .0081	26.4	do	
3157	4	.1483	.0740	.011	1,870	170,000	2,420	220,000	.09	0.9	P. ct.	.130 X .055 = .0072	34.5	do	

## SECOND LOT.

3386	1	.1474	.1474	.0217	2,929	135,000	4,006	184,610	.22	2.2	P. ct.	.123 X .123 = .0151	30.4	Silky	Not tinned.
3387	1	.1472	.1472	.0217	3,038	140,000	4,048	186,540	.18	1.8	P. ct.	.121 X .121 = .0146	32.8	do	
3388	1	.1472	.1472	.0217	2,604	130,000	3,997	184,190	.30	3.0	P. ct.	.122 X .122 = .0149	31.3	do	
3389	2	.1492	.0743	.011	1,760	160,000	2,178	198,000	.10	1.0	P. ct.	.140 X .063 = .0088	20.0	Fine silky	
3390	2	.1492	.0743	.011	1,595	145,000	2,118	192,540	.11	1.1	P. ct.	.134 X .060 = .0080	27.3	Silky	
3391	2	.1493	.0743	.011	1,760	160,000	2,168	197,090	.03	0.3	P. ct.	.135 X .065 = .0088	20.0	do	

## THIRD LOT.

3763	1	.1490	.0742	.011	1,925	175,000	2,209	200,820	.20	2.0	P. ct.	.130 X .057 = .0074	32.8	Silky	Tinned coil.
3764	1	.1490	.0735	.011	1,925	175,000	2,260	200,000	.07	0.7	P. ct.	.125 X .055 = .0069	37.3	Fine silky	
3765	1	.1490	.0740	.011	1,870	170,000	2,220	201,820	.08	0.8	P. ct.	.125 X .055 = .0069	37.3	do	
3766	2	.1490	.0730	.011	1,870	170,000	2,200	200,000	.11	1.1	P. ct.	.125 X .053 = .0069	37.3	do	
3767	2	.1487	.0730	.011	1,825	175,000	2,200	200,000	.09	0.9	P. ct.	.130 X .055 = .0071	36.5	do	
3768	2	.1487	.0730	.011	1,870	170,000	2,212	201,090	.12	1.2	P. ct.	.135 X .058 = .0078	29.1	do	
3769	3	.1484	.0728	.0108	1,674	155,000	2,038	188,700	.26	2.6	P. ct.	.130 X .053 = .0069	36.7	do	
3770	3	.1484	.0728	.0108	1,836	170,000	2,186	202,410	.18	1.8	P. ct.	.133 X .058 = .0077	28.7	do	
3771	3	.1484	.0728	.0108	1,836	170,000	2,192	202,960	.20	2.0	P. ct.	.128 X .058 = .0074	31.5	do	

TABULATION OF SQUARE AND FLAT TINNED AND UNTINNED STEEL WIRE—Continued.

## FOURTH LOT.

No. of test.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Remarks.
	Width.	Thick-ness.		Total.	Per square inch.	Total.	Per square inch.	Inch.	P. ct.				
	<i>Inch.</i>	<i>Inch.</i>	<i>Sq. in.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>						
3347	.148	.148	.0219	3,613	165,000	4,439	205,000	.22	2.2	.120 × .120 = .0144	P. ct.	Fine silky	Tinned coil.
3348	.148	.148	.0219	3,613	165,000	4,470	204,110	.22	2.2	.120 × .120 = .0144	34.2	do	
3349	.148	.148	.0219	3,723	170,000	4,566	208,490	.12	1.2	.115 × .115 = .0132	39.7	do	
3350	.148	.148	.0219	3,723	170,000	4,662	212,880	.27	2.7	.115 × .115 = .0132	39.7	do	
3351	.148	.148	.0219	3,832	175,000	4,640	211,870	.12	1.2	.120 × .120 = .0144	34.2	do	
3352	.148	.148	.0219	3,723	170,000	4,640	211,870	.20	2.0	.117 × .117 = .0137	37.4	do	

## FIFTH LOT.

Samples marked "Stock 71" and additional marks given in table.  
Length of specimens, 16" to 18".

No of test.	Additional marks.	Surface of wire.	Dimensions.		Sectional area.	Tensile strength.		Area at fracture.	Contraction of area.	Appearance of fracture.
			<i>Inch.</i>	<i>Inch.</i>		Total.	Per square inch.			
4276	No. 2 strength 3755	Tinned	.1484	.1486	<i>Sq. inch.</i> .0226	<i>Pounds.</i> 3,780	<i>Pounds.</i> 171,820	<i>Square inch.</i> .125 × .125 = .0156	<i>Per cent.</i> 29.1	Fine silky.
4277	No. 3 strength 3545	do	.1504	.1503	.0226	3,494	164,600	.120 × .120 = .0144	36.3	Do.
4278	No. 4 strength 3420	do	.1489	.1503	.0224	3,562	158,570	.118 × .118 = .0139	37.9	Do.
4279	No. 5 strength 3500	do	.1506	.1503	.0226	3,588	158,760	.115 × .115 = .0132	41.6	Do.
4280	No. 6 strength 3500	do	.1494	.1494	.0223	3,432	153,900	.115 × .115 = .0132	40.8	Do.
4281	No. 7 strength 3465	do	.1489	.1486	.0221	3,370	152,490	.114 × .114 = .0130	41.2	Do.
4282	No. 8 strength 3465	do	.1507	.1504	.0227	3,602	158,680	.113 × .113 = .0128	43.6	Do.
4283	No. 9 strength 3325	do	.1484	.1487	.0221	3,374	152,670	.111 × .111 = .0123	44.3	Do.
4284	No. 10 strength 3435	do	.1499	.1494	.0224	3,419	152,630	.111 × .111 = .0123	45.1	Do.
4285	No. 11 strength 3320	do	.1476	.1476	.0219	3,346	152,790	.115 × .115 = .0132	39.7	Do.
4286	Not marked	Not tinned	.252	Diam.	.0499	4,438	88,740	.165 diam. = .0214	57.1	Do.
4287	do	do	.252	Do.	.0499	4,387	87,920	.170 diam. = .0227	54.5	Do.
4288	do	do	.250	Do.	.0491	4,353	88,660	.170 diam. = .0227	53.8	Do.
4289	do	do	.248	Do.	.0483	4,368	90,430	.168 diam. = .0222	54.0	Do.

## SQUARE AND FLAT STEEL WIRE.

## ELECTRICALLY WELDED STEEL WIRE.

SAMPLES TAKEN FROM COILS OF FIRST LOT.

No. of test.	Coil number.	Welding burr.	Size at weld.	Dimensions of wire.		Sectional area of wire.	Tensile strength.	
				Width.	Thick-ness.		Total.	Per square inch.
			<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>
3180	1	Removed .....	.....	.0394	.0394	.0098	1,368	139,590
3181	1	do .....	.....	.0394	.0394	.0098	953	97,240
3182	1	Not removed..	.170 × .175	.0394	.0394	.0098	1,496	152,650
3183	2	Removed .....	.1002 × .0994	.0391	.0391	.0098	1,482	151,220
3184	2	do .....	.1021 × .1002	.0391	.0391	.0098	1,151	117,450
3185	2	Not removed..	.1700 × .1750	.0391	.0391	.0098	1,648	168,160
3186	3	Removed .....	.075 × .149	.1490	.0744	.0110	983	89,300
3187	3	do .....	.074 × .151	.1490	.0774	.0110	1,512	137,450
3188	3	Not removed..	.130 × .205	.1490	.0744	.0110	1,448	131,640
3189	4	Removed .....	.074 × .148	.1483	.0740	.0110	1,294	117,640
3190	4	do .....	.074 × .148	.1483	.0740	.0110	1,108	100,730
3191	4	Not removed..	.150 × .220	.1483	.0740	.0110	1,766	160,550

Specimens fractured at the welds, excepting Nos. 3185 and 3191, which fractured ".10 from the joints, and exhibited silky fractures.

Those which fractured at the welds exhibited surfaces generally smooth, with indistinct granular appearance, the granulation being more pronounced in the stronger welds. No. 3187 was in part silky.

*ELECTRICALLY WELDED STEEL WIRE.*  
 SAMPLES TAKEN FROM COILS OF SECOND LOT.

No of test.	No. of coil.	Welding burr.	Size at weld.	Dimensions of wire.		Sectional area of wire.	Tensile strength.		Fracture.
				Width.	Thick-ness.		Total.	Per square inch.	
3568	1	Not removed.	<i>Inch.</i> .250 X .250	<i>Inch.</i> .1975	<i>Inch.</i> .1474	<i>Sq. inch.</i> .0217	<i>Pounds.</i> 3,195	<i>Pounds.</i> 147,240	" 3 from middle of welding burr. Fine granular, silky center. At the weld. Granular, dull silky at corners.
3569	1	Removed	.1477 X .1484	.1474	.1476	.0217	2,790	128,570	
3570	1	do	.1484 X .1493	.1477	.1476	.0218	2,785	127,750	At the weld. Granular, dull spot at one corner.
3571	1	do	.1485 X .1485	.1478	.1475	.0218	3,238	148,530	At the weld. Granular.
3572	1	do	.1476 X .1476	.1476	.1476	.0218	2,680	122,910	At the weld. Granular, varying in size.
3573	2	Not removed.	.220 X .150	.1494	.0750	.011	1,430	133,000	" 18 from middle of welding burr. Fine silky.
3574	2	Removed	.1498 X .0746	.1495	.0750	.011	1,392	126,550	At the weld. Granular.
3575	2	do	.1491 X .0756	.1496	.0751	.011	1,338	121,640	At the weld. Granular, dull silky at one edge.
3576	2	do	.1500 X .0751	.1494	.0751	.011	1,462	132,910	" 25 from the weld. Fine silky.
3577	2	do	.1502 X .0753	.1492	.0743	.011	1,410	128,180	At the weld. Granular, dull silky at one edge.

# SQUARE AND FLAT TINNED STEEL WIRE FROM TRENTON IRON COMPANY.

*Coil A. Weight, 24½ pounds.*

FLAT WIRE.

No. 3292.

From outside end of coil.

Sectional area,  $'' .1523 \times '' .0742 = .011$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00059	.00057	.....	.....	
440	40,000	.00135	.00078	.....	.....	
660	60,000	.00214	.00079	.....	.....	
880	80,000	.00304	.00090	.....	.....	
1,100	100,000	.00407	.00103	.....	.....	
1,155	105,000	.00437	.00030	.....	.....	
1,210	110,000	.00473	.00036	.....	.....	
1,265	115,000	.00509	.00036	.....	.....	
1,320	120,000	.00551	.00042	.....	.....	
1,375	125,000	.00598	.00047	.....	.....	
1,430	130,000	.00652	.00054	.....	.....	
1,485	135,000	.00716	.00064	.....	.....	
1,540	140,000	.00795	.00079	.....	.....	
1,595	145,000	.00909	.00114	.....	.....	Tensile strength.
1,650	150,000	.01166	.00257	.....	.....	
1,698	154,360	.021	.00934	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds. 154,360  
 Elongation per inch after rupture ..... inch.. .016  
 Reduction in area after rupture, per centum of original section..... 26.4  
 Position of rupture ..... ".83 inside the gauged section  
 Character of broken surface ..... fine silky, lamellar

No. 3293.

From outside end of coil.

Sectional area  $'' .1523 \times '' .0742 = .011$  square inch.

Gauged length 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00056	.00056	.....	.....	
440	40,000	.00132	.00076	.....	.....	
550	50,000	.00167	.00035	.....	.....	
605	55,000	.00187	.00020	.....	.....	
660	60,000	.00203	.00016	.....	.....	
715	65,000	.00227	.00024	.....	.....	
770	70,000	.00247	.00020	.....	.....	
825	75,000	.00273	.00026	.....	.....	
880	80,000	.00293	.00020	.....	.....	
935	85,000	.00318	.00025	.....	.....	
990	90,000	.00341	.00023	.....	.....	
1,045	95,000	.00364	.00023	.....	.....	
1,100	100,000	.00392	.00028	.....	.....	
1,155	105,000	.00416	.00024	.....	.....	
1,210	110,000	.00449	.00033	.....	.....	Elastic limit.
1,265	115,000	.00485	.00036	.....	.....	
1,320	120,000	.00522	.00037	.....	.....	
1,375	125,000	.00562	.00040	.....	.....	
1,430	130,000	.00612	.00050	.....	.....	
1,485	135,000	.00672	.00060	.....	.....	
1,540	140,000	.00739	.00067	.....	.....	
1,595	145,000	.00843	.00104	.....	.....	
1,650	150,000	.01000	.00157	.....	.....	
1,705	155,000	.020	.010	.....	.....	Tensile strength.
1,712	155,640	.022	.002	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 155,640  
 Elastic limit per square inch of original section.....do... 125,000  
 Elongation per inch after rupture.....inch... .017  
 Elongation per inch under strain at elastic limit.....do... .00562  
 Reduction in area after rupture per centum of original section.....23.6  
 Position of rupture.....".2 inside the gauged section  
 Character of broken surface.....silky; serrated

H. Ex. 165—41

No. 3294.

From outside end of coil.

Sectional area,  $''1523 \times ''0742 = .011$  square inch.

Gauged length 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.			Initial load.
220	20,000	.00063	.00063			
440	40,000	.00138	.00075			
555	50,000	.00176	.00038			
605	55,000	.00194	.00018			
660	60,000	.00215	.00021			
715	65,000	.00236	.00021			
770	70,000	.00255	.00019			
825	75,000	.00278	.00023			
880	80,000	.00300	.00022			
935	85,000	.00322	.00022			
990	90,000	.00345	.00023			
1,045	95,000	.00370	.00025			
1,100	100,000	.00395	.00025			
1,155	105,000	.00425	.00030			
1,210	110,000	.00458	.00033			Elastic limit.
1,255	115,000	.00492	.00034			
1,320	120,000	.00530	.00038			
1,375	125,000	.00578	.00048			
1,430	130,000	.00622	.00044			
1,485	135,000	.00680	.00058			
1,540	140,000	.00752	.00072			
1,595	145,000	.00858	.00106			
1,650	150,000	.01072	.00214			
1,705	155,000	.014	.00228			Tensile strength.
1,714	155,820	.017	.003			

Tensile strength per square inch of original section ..... pounds .. 155,820  
 Elastic limit per square inch of original section ..... do .. 120,000  
 Elongation per inch after rupture ..... inch .. .006  
 Elongation per inch under strain at elastic limit ..... do .. .00530  
 Reduction in area after rupture, per centum of original section ..... 26.4  
 Position of rupture ..... 7".8 outside the gauged section  
 Character of broken surface ..... silky, lamellar



No. 3295.

From inside end of coil.

Sectional area,  $''\cdot1510 \times ''\cdot0738 = .011$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00063	.00063	.....	.....	
440	40,000	.00135	.00072	.....	.....	
550	50,000	.00173	.00038	.....	.....	
605	55,000	.00193	.00020	.....	.....	
660	60,000	.00214	.00021	.....	.....	
715	65,000	.00234	.00020	.....	.....	
770	70,000	.00256	.00022	.....	.....	
825	75,000	.00283	.00027	.....	.....	
880	80,000	.00308	.00025	.....	.....	
935	85,000	.00337	.00029	.....	.....	
990	90,000	.00364	.00027	.....	.....	
1,045	95,000	.00394	.00030	.....	.....	
1,100	100,000	.00428	.00034	.....	.....	Elastic limit.
1,155	105,000	.00468	.00040	.....	.....	
1,210	110,000	.00513	.00045	.....	.....	
1,265	115,000	.00562	.00049	.....	.....	
1,320	120,000	.00617	.00055	.....	.....	
1,375	125,000	.00687	.00070	.....	.....	
1,430	130,000	.00780	.00093	.....	.....	
1,485	135,000	.00925	.00145	.....	.....	Tensile strength.
1,540	140,000	.01150	.00225	.....	.....	
1,584	144,000	.021	.00950	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 144,000  
 Elastic limit per square inch of original section ..... do... 105,000  
 Elongation per inch after rupture ..... inch... .014  
 Elongation per inch under strain at elastic limit..... do... .00468  
 Reduction in area after rupture, per centum of original section..... 34.5  
 Position of rupture..... 2''·9 outside the gauged section  
 Character of broken surface ..... fine silky

Coil A A Weight  $27\frac{3}{4}$  pounds.

".15 SQUARE WIRE.

No. 3296.

From outside end of coil.

Sectional area  $".1510 \times ".1500 = .0226$  square inch.

Gauged length 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
113	5,000	0.	0.	0.	0.	Initial load.
452	20,000	.00057	.00057	.....	.....	
904	40,000	.00135	.00078	.....	.....	
1,130	50,000	.00178	.00043	.....	.....	
1,243	55,000	.00201	.00023	.....	.....	
1,356	60,000	.00223	.00022	.....	.....	
1,469	65,000	.00246	.00023	.....	.....	
1,582	70,000	.00270	.00024	.....	.....	
1,695	75,000	.00296	.00026	.....	.....	
1,808	80,000	.00328	.00032	.....	.....	
1,921	85,000	.00354	.00026	.....	.....	Elastic limit.
2,034	90,000	.00387	.00033	.....	.....	
2,147	95,000	.00422	.00035	.....	.....	
2,260	100,000	.00464	.00042	.....	.....	
2,373	105,000	.00509	.00045	.....	.....	
2,486	110,000	.00568	.00059	.....	.....	
2,599	115,000	.00633	.00065	.....	.....	
2,712	120,000	.00725	.00092	.....	.....	
2,825	125,000	.00891	.00166	.....	.....	
2,910	128,760	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 128,760  
 Elastic limit per square inch of original section ..... do... 95,000  
 Elongation per inch after rupture ..... inch... .006  
 Elongation per inch under strain at elastic limit ..... do... .00422  
 Reduction in area after rupture, per centum of original section ..... 41.6  
 Position of rupture ..... 7".3 outside the gauged section  
 Character of broken surface ..... fine silky

No. 3297.

From outside end of coil.

Sectional area,  $1.1510 \times 1.1500 = .0226$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
113	5,000	0.	0.	0.	0.	Initial load.
452	20,000	.00059	.00059	.....	.....	
904	40,000	.00137	.00078	.....	.....	
1,130	50,000	.00177	.00040	.....	.....	
1,243	55,000	.00200	.00023	.....	.....	
1,256	60,000	.00223	.00023	.....	.....	
1,460	65,000	.00246	.00023	.....	.....	
1,582	70,000	.00270	.00024	.....	.....	
1,695	75,000	.00295	.00025	.....	.....	
1,808	80,000	.00322	.00027	.....	.....	
1,921	85,000	.00352	.00030	.....	.....	
2,034	90,000	.00380	.00028	.....	.....	
2,147	95,000	.00418	.00038	.....	.....	
2,290	100,000	.00455	.00037	.....	.....	Elastic limit.
2,373	105,000	.00504	.00049	.....	.....	
2,486	110,000	.00558	.00054	.....	.....	
2,599	115,000	.00620	.00062	.....	.....	
2,712	120,000	.00711	.00091	.....	.....	
2,825	125,000	.00837	.00126	.....	.....	Tensile strength.
2,938	130,000	.010	.00163	.....	.....	
3,026	133,890	.014	.004	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 133,890  
 Elastic limit per square inch of original section.....do... 95,000  
 Elongation per inch after rupture.....inch... .009  
 Elongation per inch under strain at elastic limit.....do... .00455  
 Reduction in area after rupture, per centum of original section.....41.6  
 Position of rupture.....4", 6 outside the gauged section  
 Character of broken surface.....fine silky

No. 3298.

From outside end of coil.

Sectional area,  $'' .1510 \times '' .1500 = .0226$  square inch.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
113	5,000	0.	0.	0.	0.	Initial load.
452	20,000	.00063	.00063	.....	.....	
904	40,000	.00142	.00079	.....	.....	
1,130	50,000	.00187	.00045	.....	.....	
1,243	55,000	.00206	.00019	.....	.....	
1,356	60,000	.00229	.00023	.....	.....	
1,469	65,000	.00251	.00022	.....	.....	
1,582	70,000	.00275	.00024	.....	.....	
1,695	75,000	.00301	.00026	.....	.....	
1,808	80,000	.00327	.00026	.....	.....	
1,921	85,000	.00358	.00031	.....	.....	Elastic limit.
2,034	90,000	.00387	.00029	.....	.....	
2,147	95,000	.00422	.00035	.....	.....	
2,260	100,000	.00464	.00042	.....	.....	
2,373	105,000	.00511	.00047	.....	.....	
2,486	110,000	.00568	.00057	.....	.....	
2,599	115,000	.00655	.00087	.....	.....	
2,712	120,000	.00785	.00130	.....	.....	
2,825	125,000	.01060	.00275	.....	.....	
2,904	128,500	.017	.0064	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	128,500
Elastic limit per square inch of original section .....	do..	95,000
Elongation per inch after rupture .....	inch..	.010
Elongation per inch under strain at elastic limit .....	do..	.00422
Reduction in area after rupture, per centum of original section .....		44.7
Position of rupture .....	8''.75 outside the gauged section	
Character of broken surface .....	fine silky	

Coil A.A.A. Weight  $27\frac{1}{2}$  pounds.

".10 SQUARE WIRE.

No. 3309.

From outside end of coil.

Sectional area,  $".1011 \times ".1002 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00065	.00065	.....	.....	
400	40,000	.00142	.00077	.....	.....	
500	50,000	.00184	.00042	.....	.....	
550	55,000	.00204	.00020	.....	.....	
600	60,000	.00226	.00022	.....	.....	
650	65,000	.00248	.00022	.....	.....	
700	70,000	.00271	.00023	.....	.....	
750	75,000	.00298	.00027	.....	.....	
800	80,000	.00320	.00022	.....	.....	
850	85,000	.00347	.00027	.....	.....	
900	90,000	.00372	.00025	.....	.....	
950	95,000	.00403	.00031	.....	.....	
1,000	100,000	.00434	.00031	.....	.....	
1,050	105,000	.00468	.00034	.....	.....	Elastic limit.
1,100	110,000	.00510	.00042	.....	.....	
1,150	115,000	.00550	.00040	.....	.....	
1,200	120,000	.00602	.00052	.....	.....	
1,250	125,000	.00681	.00079	.....	.....	
1,300	130,000	.00763	.00082	.....	.....	
1,350	135,000	.009	.00137	.....	.....	
1,400	140,000	.012	.003	.....	.....	
1,446	144,600	.023	.011	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 144,600  
 Elastic limit per square inch of original section ..... do .. 105,000  
 Elongation per inch after rupture ..... inch.. .013  
 Elongation per inch under strain at elastic limit ..... do... .00468  
 Reduction in area after rupture, per centum of original section ..... 39.0  
 Position of rupture ..... 1/4 outside the gauged section  
 Character of broken surface ..... fine silky

No. 3310.

From outside end of coil.

Sectional area  $".1011 \times ".1002 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00057	.00057	.....	.....	
400	40,000	.00134	.00077	.....	.....	
500	50,000	.00172	.00038	.....	.....	
550	55,000	.00192	.00020	.....	.....	
600	60,000	.00212	.00020	.....	.....	
650	65,000	.00233	.00021	.....	.....	
700	70,000	.00258	.00025	.....	.....	
750	75,000	.00283	.00025	.....	.....	
800	80,000	.00308	.00025	.....	.....	
850	85,000	.00333	.00025	.....	.....	
900	90,000	.00362	.00029	.....	.....	
950	95,000	.00391	.00029	.....	.....	
1,000	100,000	.00417	.00026	.....	.....	
1,050	105,000	.00455	.00038	.....	.....	Elastic limit.
1,100	110,000	.00498	.00043	.....	.....	
1,150	115,000	.00540	.00042	.....	.....	
1,200	120,000	.00600	.00060	.....	.....	
1,250	125,000	.00669	.00069	.....	.....	
1,300	130,000	.00760	.00091	.....	.....	Tensile strength.
1,350	135,000	.00902	.00142	.....	.....	
1,400	140,000	.012	.00298	.....	.....	
1,445	144,500	.023	.011	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 144,500  
 Elastic limit per square inch of original section.....do... 115,000  
 Elongation per inch after rupture.....inch... .013  
 Elongation per inch under strain at elastic limit.....do... .00455  
 Reduction in area after rupture, per centum of original section.....do... 39.0  
 Position of rupture.....1 11".75 outside the gauged section  
 Character of broken surface.....fine silky

No. 3311.

From outside end of coil.

Sectional area,  $".1011 \times ".1002 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	.....	.....	Initial load.
200	20,000	.00067	.00067	.....	.....	
400	40,000	.00154	.00087	.....	.....	
500	50,000	.00193	.00039	.....	.....	
550	55,000	.00213	.00020	.....	.....	
600	60,000	.00233	.00020	.....	.....	
650	65,000	.00255	.00022	.....	.....	
700	70,000	.00283	.00028	.....	.....	
750	75,000	.00305	.00022	.....	.....	
800	80,000	.00330	.00025	.....	.....	
850	85,000	.00357	.00027	.....	.....	Elastic limit.
900	90,000	.00387	.00030	.....	.....	
950	95,000	.00413	.00026	.....	.....	
1,000	100,000	.00445	.00032	.....	.....	
1,050	105,000	.00481	.00036	.....	.....	
1,100	110,000	.00520	.00039	.....	.....	
1,150	115,000	.00562	.00042	.....	.....	
1,200	120,000	.00618	.00056	.....	.....	
1,250	125,000	.00700	.00082	.....	.....	
1,300	130,000	.00785	.00085	.....	.....	Tensile strength.
1,350	135,000	.00917	.00132	.....	.....	
1,400	140,000	.013	.00363	.....	.....	
1,442	144,200	.025	.012	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 144,200  
 Elastic limit per square inch of original section ..... do... 110,000  
 Elongation per inch after rupture..... inch... .020  
 Elongation per inch under strain at elastic limit..... do... .00520  
 Reduction in area after rupture, per centum of original section..... 36.0  
 Position of rupture..... 3".45 inside the gauged length  
 Character of broken surface..... fine silky

TABULATION OF SQUARE AND FLAT STEEL WIRE FROM TRENTON IRON COMPANY.

No. of test.	Mark on coil.	Dimensions in inches.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.
		Width.	Thick-ness.		Total.	Per square inch.	Total.	Per square inch.	Inch.	Per cent.			
3282	A	.1523	.0742	Sq. inch.	Pounds.	Pounds.	Pounds.	Pounds.	.16	1.6	"	Per cent.	Fine silky, lamellar.
3283	A	.1523	.0742	.011	1,375	125,000	1,698	154,360	.17	1.7	.135 × .060 = .0081	26.4	Silky, serrated.
3294	A	.1523	.0742	.011	1,330	120,000	1,712	155,640	.06	0.6	.140 × .060 = .0084	23.6	Silky, lamellar.
3295	A	.1510	.0738	.011	1,155	105,000	1,584	144,000	.14	1.4	.130 × .065 = .0072	26.4	Fine silky.
3296	A	.1510	.0738	.0226	2,147	95,000	2,910	128,760	.06	0.6	.115 × .115 = .0132	41.6	Do.
3297	A	.1510	.0738	.0226	2,260	100,000	3,026	133,890	.09	0.9	.112 × .112 = .0125	41.6	Do.
3298	A	.1510	.0738	.0226	2,147	95,000	2,904	128,500	.10	1.0	.112 × .112 = .0125	44.7	Do.
3309	AAA	.1011	.1002	.010	1,050	105,000	1,446	144,600	.13	1.3	.078 × .078 = .0061	39.0	Do.
3310	AAA	.1011	.1002	.010	1,050	105,000	1,445	144,500	.13	1.3	.078 × .078 = .0061	39.0	Do.
3311	AAA	.1011	.1002	.010	1,100	110,000	1,442	144,200	.20	2.0	.080 × .080 = .0064	36.0	Do.

ELECTRICALLY WELDED STEEL WIRE FROM TRENTON IRON COMPANY.

No. of test.	Coil.	Welding burr.	Size at weld.	Dimensions of wire.		Sectional area of wire.	Tensile strength.		Fracture.
				Width.	Thick-ness.		Total.	Per square inch.	
3356	A	Removed	"	Inch.	Inch.	Sq. Inch.	Pounds.	Pounds.	About .06 from weld, took oblique direction across wire. Silky.
3357	A	do	.147 × .075	.1510	.0735	.0110	1,474	134,000	At weld. Dull luster.
3358	A	Not removed	.150 × .075	.1510	.0735	.0110	1,532	139,270	At weld. Dull luster.
3359	AA	Removed	.200 × .140	.1510	.1500	.0226	1,571	142,820	" .70 from weld. Silky.
3360	AA	do	.149 × .145	.1510	.1500	.0226	2,448	108,320	At weld. Dull luster in part, granular in part.
3361	AA	do	.149 × .146	.1510	.1500	.0226	2,645	117,040	Silky.
3362	AAA	Not removed	.220 × .220	.1010	.1012	.0102	2,602	115,130	About .12 from the weld. Silky.
3363	AAA	do	.1014 × .0969	.1006	.1011	.0102	1,353	132,650	" .10 from the weld. Silky.
3364	AAA	do	.1006 × .0906	.1006	.1014	.0102	1,453	142,940	At weld. Dull luster. A small piece detached at place of rupture.
3364	AAA	Not removed	.180 × .180	.1006	.1014	.0102	1,547	151,670	At weld. Dull luster. A small piece detached at place of rupture.



**FLAT AND SQUARE TINNED AND UNTINNED STEEL WIRE FROM  
THE WASHBURN & MOEN MANUFACTURING COMPANY.**

Marks.	Surface of wire.	Nominal dimensions.	Actual dimensions.		Weight of coil.		Diameter of curve of wire.	
			One end.	Other end.			In coil.	When released.
Sample 1.	Black...	" "	" "	" "	<i>Pounds.</i>	<i>Ounces.</i>	<i>Inches.</i>	<i>Inches.</i>
Sample 2.	Tinned...	.10×.10	.0995×.0996	.1001×.1003	32	12	31	(*)
Sample 3.	Black...	.10×.10	.0993×.1002	.0992×.0996	33	8	18	36
Sample 3.	Black...	.15×.075	.1500×.0740	.1512×.0755	50	.....	21	54
Sample 4.	Tinned...	.15×.075	.1480×.0743	.1500×.0745	30	.....	17½	42

\* Nearly straight.

The surfaces of sample No. 1 were smooth, curvature of corners  $\frac{1}{16}$ .01 to  $\frac{1}{16}$ .02 radius; the larger radius being found at the end of the coil having the largest cross-section dimensions.

*Sample 2.*—Surfaces smooth; tinning generally smooth and apparently of uniform thickness, although in localities the tinning was thickened, reaching  $\frac{1}{16}$ .0003±.

*Sample 3.*—Surfaces smooth and corners well rounded to about  $\frac{1}{16}$ .01 radius.

*Sample 4.*—Surfaces smooth and corners well rounded to about  $\frac{1}{16}$ .01 radius. The tinning apparently well distributed over three surfaces. Along one surface on edge the tinning was thick in places,  $\frac{1}{16}$ .0003±, and in places the wire was naked.

The tinning along the edges was thus defective for a considerable part of its length.

*Sample 1.*

No. 3772.

Sectional area,  $".0995 \times ".0996 = .0099$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
192	20,000	.00072	.00072	.....	.....	
396	40,000	.00147	.00075	.....	.....	
594	60,000	.00215	.00068	.....	.....	
792	80,000	.00287	.00072	.....	.....	
990	100,000	.00361	.00074	.....	.....	
1,188	120,000	.00437	.00076	.....	.....	
1,237	125,000	.00451	.00014	.....	.....	
1,287	130,000	.00468	.00017	.....	.....	
1,336	135,000	.00487	.00019	.....	.....	
1,386	140,000	.00506	.00019	.....	.....	
1,436	145,000	.00526	.00020	.....	.....	
1,485	150,000	.00542	.00016	.....	.....	
1,535	155,000	.00568	.00026	.....	.....	
1,584	160,000	.00588	.00020	.....	.....	
1,634	165,000	.00613	.00025	.....	.....	Elastic limit.
1,683	170,000	.020	.01387	.....	.....	
1,733	175,000	.033	.013	.....	.....	Tensile strength.
1,745	176,260	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....pounds.. 176,260  
 Elastic limit per square inch of original section .....do... 165,000  
 Elongation per inch after rupture .....inch... .026  
 Elongation per inch under strain at elastic limit .....do... .00613  
 Reduction in area after rupture, per centum of original section ..... 50.5  
 Position of rupture .....".95 outside the gauged section  
 Character of broken surface .....fine silky

No. 3773.

Sectional area,  $''0995 \times ''0996 = .0099$  square inch.  
 Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00078	.00078	.....	.....	
396	40,000	.00152	.00074	.....	.....	
594	60,000	.00222	.00070	.....	.....	
792	80,000	.00294	.00072	.....	.....	
990	100,000	.00360	.00066	.....	.....	
1,188	120,000	.00441	.00061	.....	.....	
1,237	125,000	.00459	.00018	.....	.....	
1,287	130,000	.00478	.00019	.....	.....	
1,336	135,000	.00498	.00020	.....	.....	
1,386	140,000	.00518	.00020	.....	.....	
1,436	145,000	.00540	.00022	.....	.....	
1,485	150,000	.00558	.00018	.....	.....	
1,535	155,000	.00578	.00020	.....	.....	
1,584	160,000	.00601	.00023	.....	.....	
1,634	165,000	.00662	.00061	.....	.....	Elastic limit.
1,683	170,000	.022	.01538	.....	.....	Tensile strength.
1,733	175,000	.034	.012	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 175,000  
 Elastic limit per square inch of original section ..... do.... 160,000  
 Elongation per inch after rupture ..... inch.. .023  
 Reduction in area after rupture, per centum of original section ..... 50.5  
 Position of rupture ..... 1''.80 outside the gauged section  
 Character of broken surface ..... fine silky

No. 3774.

Sectional area,  $".1000 \times ".1000 = .010$  square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
50	5,000	0.	0.	0.	0.	
200	20,000	.00070	.00070	.....	.....	
400	40,000	.00146	.00076	.....	.....	
600	66,000	.00220	.00074	.....	.....	
800	80,000	.00292	.00072	.....	.....	
1,000	100,000	.00361	.00069	.....	.....	
1,200	120,000	.00436	.00075	.....	.....	
1,250	125,000	.00457	.00021	.....	.....	
1,300	130,000	.00471	.00014	.....	.....	
1,350	135,000	.00492	.00021	.....	.....	
1,400	140,000	.00508	.00016	.....	.....	
1,450	145,000	.00531	.00023	.....	.....	
1,500	150,000	.00554	.00023	.....	.....	
1,550	155,000	.00574	.00020	.....	.....	
1,600	160,000	.00600	.00026	.....	.....	Elastic limit.
1,650	165,000	.01280	.00680	.....	.....	Tensile strength.
1,700	170,000	.027	.01420	.....	.....	
1,735	173,500	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	173,500
Elastic limit per square inch of original section .....	do...	160,000
Elongation per inch after rupture .....	inch..	.030
Elongation per inch under strain at elastic limit .....	do...	.00600
Reduction in area after rupture, per centum of original section .....		48.0
Position of rupture .....	".10 outside the gauged section	
Character of broken surface .....	fine silky	

## Sample 2.

No. 3775.

Sectional area,  $''1000 \times ''0994 = .0099$  square inch.  
 Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
49	5,000	0.	0.	0.	0.	
198	20,000	.00066	.00066	.....	.....	
396	40,000	.00142	.00076	.....	.....	
594	60,000	.00213	.00071	.....	.....	
792	80,000	.00284	.00071	.....	.....	
990	100,000	.00364	.00080	.....	.....	
1,188	120,000	.00444	.00080	.....	.....	
1,237	125,000	.00458	.00014	.....	.....	
1,287	130,000	.00483	.00025	.....	.....	
1,336	135,000	.00503	.00020	.....	.....	
1,386	140,000	.00524	.00021	.....	.....	
1,436	145,000	.00545	.00021	.....	.....	
1,485	150,000	.00568	.00023	.....	.....	
1,535	155,000	.00592	.00024	.....	.....	
1,584	160,000	.00618	.00026	.....	.....	
1,634	165,000	.00658	.00040	.....	.....	Elastic limit.
1,683	170,000	.00793	.00135	.....	.....	
1,733	175,000	.01200	.00407	.....	.....	
1,782	180,000	.024	.012	.....	.....	Tensile strength.
1,830	184,840	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 184,840  
 Elastic limit per square inch of original section .....do... 165,000  
 Elongation per inch after rupture.....inch... .025  
 Elongation per inch under strain at elastic limit.....do... .00658  
 Reduction in area after rupture, per centum of original section..... 50.5  
 Position of rupture .....3''.5 outside the gauged section  
 Character of broken surface.....fine silky

No. 3776.

Sectional area,  $".1000 \times ".0994 = .0099$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
49	5,000	0.	0.	0.	0.	Initial load.
198	20,000	.00070	.00070	.....	.....	
396	40,000	.00144	.00074	.....	.....	
594	60,000	.00220	.00076	.....	.....	
792	80,000	.00290	.00070	.....	.....	
990	100,000	.00371	.00081	.....	.....	
1,188	120,000	.00445	.00074	.....	.....	
1,237	125,000	.00463	.00018	.....	.....	
1,287	130,000	.00485	.00022	.....	.....	
1,336	135,000	.00503	.00018	.....	.....	
1,386	140,000	.00531	.00028	.....	.....	
1,436	145,000	.00551	.00020	.....	.....	
1,485	150,000	.00579	.00018	.....	.....	
1,535	155,000	.00599	.00020	.....	.....	
1,584	160,000	.00624	.00025	.....	.....	Elastic limit.
1,634	165,000	.00663	.00039	.....	.....	
1,683	170,000	.00805	.00142	.....	.....	
1,733	175,000	.01255	.00450	.....	.....	Tensile strength.
1,782	180,000	.027	.01445	.....	.....	
1,831	185,000	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 185,000  
 Elastic limit per square inch of original section.....do... 165,000  
 Elongation per inch after rupture.....inch... .041  
 Elongation per inch under strain at elastic limit.....do... .00663  
 Reduction in area after rupture, per centum of original section.....50.5  
 Position of rupture.....1/.05 inside the gauged section  
 Character of broken surface.....fine silky

No. 3777.

Sectional area,  $1.003 \times .0995 = .010$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
50	5,000	0.	0.	0.	0.	Initial load.
200	20,000	.00074	.00074	.....	.....	
400	40,000	.00143	.00069	.....	.....	
600	60,000	.00216	.00073	.....	.....	
800	80,000	.00291	.00075	.....	.....	
1,000	100,000	.00366	.00075	.....	.....	
1,200	120,000	.00449	.00083	.....	.....	
1,250	125,000	.00466	.00017	.....	.....	
1,300	130,000	.00484	.00018	.....	.....	
1,350	135,000	.00506	.00022	.....	.....	
1,400	140,000	.00526	.00020	.....	.....	
1,450	145,000	.00546	.00020	.....	.....	
1,500	150,000	.00573	.00027	.....	.....	
1,550	155,000	.00595	.00022	.....	.....	
1,600	160,000	.00624	.00029	.....	.....	
1,650	165,000	.00654	.00030	.....	.....	Elastic limit.
1,700	170,000	.00806	.00152	.....	.....	
1,750	175,000	.013	.00494	.....	.....	
1,800	180,000	.024	.011	.....	.....	Tensile strength.
1,834	183,400	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 183,400  
 Elastic limit per square inch of original section.....do... 165,000  
 Elongation per inch after rupture.....inch... .021  
 Elongation per inch under strain at elastic limit.....do... .00654  
 Reduction in area after rupture, per centum of original section.....48.0  
 Position of rupture.....3".5 outside the gauged section  
 Character of broken surface.....fine, silky

H. Ex. 165—42

*Sample 3.*

No. 3778.

Sectional area  $".0758 \times ".1510 = ".011$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Persquare inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00065	.00065	.....	.....	
440	40,000	.00135	.00070	.....	.....	
660	60,000	.00209	.00074	.....	.....	
880	80,000	.00274	.00065	.....	.....	
1,100	100,000	.00345	.00071	.....	.....	
1,320	120,000	.00424	.00079	.....	.....	
1,375	125,000	.00438	.00014	.....	.....	
1,430	130,000	.00458	.00020	.....	.....	
1,485	135,000	.00479	.00021	.....	.....	
1,540	140,000	.00499	.00020	.....	.....	Elastic limit.
1,595	145,000	.00527	.00028	.....	.....	
1,650	150,000	.00547	.00020	.....	.....	
1,705	155,000	.00577	.00030	.....	.....	
1,760	160,000	.00615	.00038	.....	.....	
1,815	165,000	.00682	.00067	.....	.....	
1,870	170,000	.00855	.00173	.....	.....	
1,925	175,000	.01245	.00390	.....	.....	
1,980	180,000	.022	.00955	.....	.....	
2,035	185,000	.031	.009	.....	.....	Tensile strength.
2,058	187,090	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....pounds.. 187,090  
 Elastic limit per square inch of original section.....do.. 160,000  
 Elongation per inch after rupture.....inch.. .027  
 Elongation per inch under strain at elastic limit.....do.. .00615  
 Reduction in area after rupture, per centum of original section.....36.4  
 Position of rupture.....1".90 outside the gauged section  
 Character of broken surface.....fine silky



No. 3779.

Sectional area,  $".1510 \times ".0756 = .011$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00071	.00071	.....	.....	
440	40,000	.00188	.00087	.....	.....	
660	60,000	.00212	.00074	.....	.....	
880	80,000	.00282	.00070	.....	.....	
1,100	100,000	.00357	.00075	.....	.....	
1,320	120,000	.00428	.00071	.....	.....	
1,575	125,000	.00444	.00016	.....	.....	
1,430	130,000	.00468	.00024	.....	.....	
1,485	135,000	.00488	.00020	.....	.....	
1,540	140,000	.00511	.00023	.....	.....	Elastic limit.
1,595	145,000	.00532	.00021	.....	.....	
1,650	150,000	.00559	.00027	.....	.....	
1,705	155,000	.00589	.00030	.....	.....	
1,760	160,000	.00622	.00033	.....	.....	
1,815	165,000	.00694	.00072	.....	.....	
1,870	170,000	.00863	.00169	.....	.....	
1,925	175,000	.01180	.00317	.....	.....	
1,980	180,000	.022	.01020	.....	.....	
2,035	185,000	.029	.007	.....	.....	
2,063	187,550	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 187,550  
 Elastic limit per square inch of original section.....do... 160,000  
 Elongation per inch after rupture.....inch.. .031  
 Elongation per inch under strain at elastic limit.....do... .00622  
 Reduction in area after rupture, per centum of original section.....40.0  
 Position of rupture.....3".25 outside of the gauged section  
 Character of broken surface.....fine silky

No. 3780.

Sectional area,  $''\cdot1510 \times ''\cdot0756 = .011$  square inch.  
Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00069	.00069	.....	.....	
440	40,000	.00142	.00073	.....	.....	
660	60,000	.00211	.00069	.....	.....	
880	80,000	.00282	.00071	.....	.....	
1,100	100,000	.00352	.00070	.....	.....	
1,320	120,000	.00428	.00076	.....	.....	
1,375	125,000	.00444	.00016	.....	.....	
1,430	130,000	.00462	.00018	.....	.....	
1,485	135,000	.00484	.00022	.....	.....	
1,540	140,000	.00506	.00022	.....	.....	Elastic limit.
1,595	145,000	.00529	.00023	.....	.....	
1,650	150,000	.00559	.00030	.....	.....	
1,705	155,000	.00582	.00023	.....	.....	
1,760	160,000	.00622	.00040	.....	.....	
1,815	165,000	.00708	.00081	.....	.....	
1,870	170,000	.00818	.00215	.....	.....	
1,925	175,000	.015	.00582	.....	.....	
1,980	180,000	.020	.005	.....	.....	
2,035	185,000	.031	.011	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 185,000  
 Elastic limit per square inch of original section.....do... 155,000  
 Elongation per inch after rupture.....inch.. .022  
 Elongation per inch under strain at elastic limit.....do... .00582  
 Reduction in area after rupture, per centum of original section.....30.9  
 Position of rupture .....7".9 outside the gauged section  
 Character of broken surface .....fine silky

*Sample 4.*

No. 3781.

Sectional area,  $".1483 \times ".0742 = .011$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5, 000	0.	0.	0.	0.	Initial load.
220	20, 000	.00074	.00074	.....	.....	
440	40, 000	.00146	.00072	.....	.....	
660	60, 000	.00218	.00072	.....	.....	
880	80, 000	.00294	.00076	.....	.....	
1, 100	100, 000	.00370	.00076	.....	.....	Elastic limit.
1, 320	120, 000	.00464	.00094	.....	.....	
1, 375	125, 000	.00489	.00025	.....	.....	
1, 430	130, 000	.00530	.00041	.....	.....	
1, 485	135, 000	.00589	.00059	.....	.....	
1, 540	140, 000	.00685	.00096	.....	.....	
1, 595	145, 000	.00862	.00177	.....	.....	
1, 650	150, 000	.01225	.00363	.....	.....	
1, 705	155, 000	.017	.00475	.....	.....	
1, 760	160, 000	.023	.006	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 160, 000  
 Elastic limit per square inch of original section.....do... 125, 000  
 Elongation per inch after rupture.....inch... .012  
 Elongation per inch under strain at elastic limit.....do... .00489  
 Reduction in area after rupture, per centum of original section.....40. 0  
 Position of rupture.....11".1 outside the gauged section  
 Character of broken surface.....fine silky

No. 3782.

Sectional area,  $".1484 \times ".0746 = .011$  square inch.  
 Gauged length, 10".

Applied loads		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
55	5,000	0.	0.	0.	0.	Initial load.
220	20,000	.00072	.00072	.....	.....	
440	40,000	.00147	.00075	.....	.....	
660	60,000	.00220	.00073	.....	.....	
880	80,000	.00291	.00071	.....	.....	
1,100	100,000	.00368	.00077	.....	.....	Elastic limit.
1,320	120,000	.00471	.00103	.....	.....	
1,375	122,000	.00512	.00041	.....	.....	
1,430	130,000	.00570	.00058	.....	.....	
1,485	135,000	.00648	.00078	.....	.....	
1,540	140,000	.00739	.00091	.....	.....	
1,595	145,000	.00880	.00141	.....	.....	
1,650	150,000	.01138	.00258	.....	.....	
1,690	153,640	.....	.....	.....	.....	
						Tensile strength.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 153,640  
 Elastic limit per square inch of original section.....do... 120,000  
 Elongation per inch after rupture.....inch... .014  
 Elongation per inch under strain at elastic limit.....do... .00471  
 Reduction in area after rupture, per centum of original section..... 48.2  
 Position of rupture.....1".25 inside the gauged section  
 Character of broken surface.....fine silky

No. 3783.

Sectional area,  $".1484 \times ".0744 = .011$  square inch.  
 Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
55	5,000	0.	0.	0.	0.	
220	20,000	.00075	.00075	.....	.....	
440	40,000	.00140	.00065	.....	.....	
660	60,000	.00222	.00082	.....	.....	
880	80,000	.00294	.00072	.....	.....	Elastic limit.
1,100	100,000	.00369	.00075	.....	.....	
1,320	120,000	.00465	.00096	.....	.....	
1,375	125,000	.00489	.00024	.....	.....	
1,430	130,000	.00519	.00030	.....	.....	
1,485	135,000	.00559	.00040	.....	.....	
1,540	140,000	.00613	.00054	.....	.....	
1,595	145,000	.00700	.00087	.....	.....	
1,650	150,000	.00878	.00178	.....	.....	
1,705	155,000	.012	.00322	.....	.....	
1,760	160,000	.014	.002	.....	.....	Tensile strength.
1,784	162,180	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 162,180  
 Elastic limit per square inch of original section ..... do... 130,000  
 Elongation per inch after rupture ..... inch.. .008  
 Elongation per inch under strain at elastic limit ..... do... .00519  
 Reduction in area after rupture, per centum of original section ..... 49.1  
 Position of rupture ..... 2".3 outside the gauged section  
 Character of broken surface ..... fine silky

TABULATION OF SQUARE AND FLAT TINNED AND UNTINNED STEEL WIRE FROM WASHBURN & MOEN MANUFACTURING COMPANY.

No. of test.	Mark on coil.	Dimensions in inches.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Remarks.
		Width.	Thick-ness.		Total.	Per square inch.	Total.	Per square inch.	Inch.	Per ct.				
3772	1	.0995	.0996	Sq. inch. .0099	Pounds. 1,634	Pounds. 165,000	Pounds. 1,745	Pounds. 176,260	.26	2.6	" .070 X .070 = .0049	Per cent. 50.5	Fine silky	} Coil not tinned.
3773	1	.0995	.0996	.0099	1,584	160,000	1,733	175,000	.23	2.3	.070 X .070 = .0049	50.5	do	
3774	1	.1000	.1000	.0100	1,600	160,000	1,735	173,500	.30	3.0	.072 X .072 = .0052	48.0	do	
3775	2	.1000	.0994	.0099	1,683	170,000	1,830	184,840	.25	2.5	.070 X .070 = .0049	50.5	do	} Coil tinned.
3776	2	.1000	.0994	.0099	1,634	165,000	1,831	185,000	.41	4.1	.070 X .070 = .0049	50.5	do	
3777	2	.1003	.0995	.0100	1,650	165,000	1,834	183,400	.21	2.1	.072 X .072 = .0052	48.0	do	
3778	3	.1510	.0758	.011	1,760	160,000	2,058	187,000	.27	2.7	.120 X .058 = .0070	36.4	do	} Coil not tinned.
3779	3	.1510	.0756	.011	1,760	160,000	2,063	187,550	.31	3.1	.120 X .058 = .0068	40.0	do	
3780	3	.1510	.0756	.011	1,705	155,000	2,035	185,000	.22	2.2	.123 X .062 = .0076	30.9	do	
3781	4	.1483	.0742	.011	1,375	125,000	1,760	160,000	.12	1.2	.114 X .058 = .0066	40.0	do	} Coil tinned.
3782	4	.1484	.0746	.011	1,320	120,000	1,690	153,640	.14	1.4	.110 X .052 = .0057	48.2	do	
3783	4	.1484	.0744	.011	1,430	130,000	1,784	162,180	.08	0.8	.112 X .050 = .0056	49.0	do	

## WIRE IN STORE AT WATERTOWN ARSENAL.

## ELECTRICALLY WELDED ".15 SQUARE TINNED STEEL WIRE.

Welds made at the works of the Thomson Electric Welding Company, Lynn, Mass.

Welding burrs removed before testing.

No. of test.	Dimensions of wire.	Sectional area.	Size of welding burr.	Tensile strength.	
				Total.	Per square inch.
	<i>Inch.</i>	<i>Sq. inch.</i>	<i>Inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>
2916	.1496 × .1503	.0225	.25 × .26	2,760	122,670
2917	.1496 × .1503	.0225	.23 × .24	2,654	117,960
2918	.1496 × .1503	.0225	.23 × .23	2,704	120,180
2919	.1496 × .1503	.0225	.24 × .24	2,645	117,560
2920	.1496 × .1503	.0225	.23 × .24	2,612	116,090
2921	.1496 × .1503	.0225	.23 × .24	2,805	124,670

All specimens fractured at the welds except No. 2918.

## ELECTRICALLY ANNEALED ".15 SQUARE TINNED STEEL WIRE.

Specimens of square tinned steel wire which were annealed in the welding machine but not welded.

No. of test.	Nominal size of wire.	Actual dimensions of wire.	Sectional area.	Tensile strength.		Remarks.
				Total.	Per sq. inch.	
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
2922	".15 square..	.1498 × .1498	.0224	2,586	115,450	Heated bright red; cooled without borax. Heated to a welding heat, and cooled in clamps with borax. Heated to welding heat and cooled in clamps without borax. Heated bright red, and cooled with borax. Heated to welding heat with borax. Heated to welding heat without borax. Heated bright red without borax.
2923	".15 square..	.1500 × .1502	.0225	2,597	115,420	
2924	".15 square..	.1498 × .1500	.0225	2,384	105,980	
2925	".10 square..	.1000 × .1000	.0100	1,485	148,500	
2926	".10 square..	.0998 × .0995	.0099	1,432	144,650	
2927	".10 square..	.1000 × .1000	.0100	1,428	142,800	
2928	".10 square..	.0998 × .0998	.0100	1,399	139,900	





---

ALUMINUM,  
AND  
ALUMINUM BRASS AND BRONZE,  
FROM  
THE ALUMINUM COMPANY, LIMITED,  
OLDBURG, NEAR BIRMINGHAM, ENGLAND.

---



In making the hardness determinations, two different pressures were employed.

The usual pressure, 10,000 pounds, was applied to one specimen each of 10 per cent. aluminum bronze and 3 per cent. aluminum brass; these being Nos. 4191 and 4194 respectively.

The hardness of these specimens is therefore directly comparable with the hardness of other metals as ordinarily reported.

On account of the softness of the pure aluminum specimens, a lower pressure was used on the indenting tool. Four thousand four hundred pounds made a cut extending diametrically nearly across the specimen, therefore no higher pressure was applied, and to furnish data for direct comparisons among these specimens, one piece of each of the aluminum bronze and aluminum brass was indented with the same pressure.

### ALUMINUM.

No. 4188.

Mark, 1.

Diameter, ".769.

Sectional area, .464 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
464	1,000	0.	0.	0.	0.	Initial load.
928	2,000	.000133	.000133	0.	.....	
1,392	3,000	.000267	.000134	.....	.....	
1,856	4,000	.000367	.000100	.....	.....	
2,320	5,000	.000517	.000150	.000033	.000033	Elastic limit.
2,784	6,000	.000750	.000167	.....	.....	
3,248	7,000	.001183	.000433	.000500	.000467	
3,712	8,000	.002083	.000900	.....	.....	
4,176	9,000	.003967	.001884	.....	.....	
4,640	10,000	.006250	.002283	.005133	.004633	
5,104	11,000	.009883	.003633	.....	.....	
5,568	12,000	.013600	.003717	.012167	.007034	
6,032	13,000	.020100	.012500	.....	.....	Surface presents wavy appearance.
6,496	14,000	.027417	.007317	.025667	.013500	
6,960	15,000	.0350	.007583	.....	.....	
7,424	16,000	.0500	.0150	.....	.....	
7,888	17,000	.0700	.0200	.....	.....	
8,352	18,000	.1167	.0467	.....	.....	
8,560	18,450	.....	.....	.....	.....	Tensile strength.

#### General summary.

Specific gravity.....	2.7199
Hardness, under pressure of 4,400 pounds.....	4.63
Tensile strength per square inch of original section.....	pounds.. 18,450
Elastic limit per square inch of original section.....	do... 5,000
Elongation per inch after rupture.....	inch... .1867
Elongation per inch under strain at elastic limit.....	do... .000517
Reduction in diameter at point of rupture.....	do... .149
Reduction in area after rupture, per centum of original section.....	do... 34.9
Position of rupture.....	"5 from neck
Character of broken surface.....	..... silky; oblique
Elongation of inch sections.....	"30*, ".18, ".20, ".17, ".15, ".12

## ALUMINUM.

No. 4189.

Marks, 2.

Diameter, ".788.

Sectional area, .488 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
488	1,000	0.	0.	0.	0.	Initial load.
876	2,000	.000117	.000117	0.	-----	
1,464	3,000	.000200	.000083	-----	-----	
1,952	4,000	.000300	.000100	0.	-----	
2,440	5,000	.000383	.000083	-----	-----	
2,928	6,000	.000483	.000100	0.	-----	Elastic limit.
3,416	7,000	.000633	.000150	0.	-----	
3,904	8,000	.000800	.000167	.000050	.000050	
4,392	9,000	.001000	.000200	-----	-----	
4,880	10,000	.001317	.000317	.000833	.000783	
5,368	11,000	.003167	.001350	-----	-----	
5,856	12,000	.005050	.001883	.003833	.003000	
6,344	13,000	.008800	.003750	-----	-----	
6,832	14,000	.013800	.005000	.012300	.008467	
7,320	15,000	.020417	.006617	-----	-----	Surface presents wavy appearance.
7,808	16,000	.029517	.009100	.027783	.015483	
8,296	17,000	.0467	.017183	-----	-----	Tensile strength.
8,784	18,000	.0833	.0366	-----	-----	
8,920	18,280	-----	-----	-----	-----	

*General summary.*

Specific gravity.....	2.7242
Hardness, under pressure of 4,400 pounds.....	4.25
Tensile strength per square inch of original section.....	pounds.. 18,280
Elastic limit per square inch of original section.....	do.. 8,000
Elongation per inch after rupture.....	inch.. .1817
Elongation per inch under strain at elastic limit.....	do.. .000800
Reduction in diameter at point of rupture.....	do.. .248
Reduction in area after rupture, per centum of original section.....	53.1
Position of rupture.....	.2". 3 from neck
Character of broken surface.....	silky; oblique
Elongation of inch sections.....	" 16, " 49*, " 22, " 10, " 07, " 05

## ALUMINUM.

No. 4190.

Mark, 3.

Diameter, ".779.

Sectional area, .477 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
477	1,000	0.	0.	0.	0.	Initial load.
954	2,000	.000117	.000117	0.	0.	
1,431	3,000	.000200	.000083	0.	0.	
1,908	4,000	.000300	.000100	0.	0.	
2,385	5,000	.000323	.000083	0.	0.	
2,862	6,000	.000467	.000084	0.	0.	Elastic limit.
3,339	7,000	.000633	.000166	0.	0.	
3,816	8,000	.000850	.000217	.000133	.000133	
4,293	9,000	.001233	.000383	0.	0.	
4,770	10,000	.002050	.000817	.001083	.000950	
5,247	11,000	.003133	.001083	0.	0.	
5,724	12,000	.005283	.002150	.004050	.002967	
6,201	13,000	.008767	.003484	0.	0.	
6,678	14,000	.013800	.005033	0.	0.	
7,155	15,000	.019717	.005917	0.	0.	
7,632	16,000	.030533	.010816	0.	0.	Tensile strength.
8,109	17,000	.0467	.016167	0.	0.	
8,586	18,000	.0793	.0316	0.	0.	
8,770	18,390	0.	0.	0.	0.	

## General summary.

Tensile strength per square inch of original section	pounds..	18,390
Elastic limit per square inch of original section	do..	6,000
Elongation per inch after rupture	inch..	.1050
Elongation per inch under strain at elastic limit	do..	.000467
Reduction in diameter at point of rupture	do..	.119
Reduction in area after rupture, per centum of original section		28.3
Position of rupture	4" from neck	
Character of broken surface	silky, oblique	
Elongation of inch sections	".07, ".09, ".07, ".08, ".10, ".22*	

## 10 PER CENT. ALUMINUM BRONZE.

No. 4191.

Marks, 4-10.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000300	.000300			
5,000	10,000	.000633	.000333	.000017	.000017	
7,500	15,000	.001000	.000367	.000033	.000016	
9,000	18,000	.001150	.000150			
9,500	19,000	.001200	.000050			Elastic limit.
10,000	20,000	.001467	.000267	.000150	.000117	
10,500	21,000	.001600	.000133			
11,000	22,000	.001800	.000200			
11,500	23,000	.002033	.000233			
12,000	24,000	.002367	.000334			
12,500	25,000	.002833	.000466	.001033	.000883	
13,000	26,000	.003200	.000367			
13,500	27,000	.003833	.000633			
14,000	28,000	.004500	.000667			
14,500	29,000	.005300	.000800			
15,000	30,000	.006367	.001067	.003807	.002834	
15,500	31,000	.007117	.000850			
16,000	32,000	.008033	.000916			
16,500	33,000	.009583	.001550			
17,000	34,000	.010667	.001084			
17,500	35,000	.012500	.001833	.009107	.005300	
18,000	36,000	.013167	.000667			
18,500	37,000	.016000	.002833			
19,000	38,000	.018083	.002083			
19,500	39,000	.020333	.002250			
20,000	40,000	.023117	.002784	.018150	.009783	
20,500	41,000	.0267	.002583			
21,000	42,000	.0292	.0025			
21,500	43,000	.0317	.0025			
22,000	44,000	.0350	.0033			
22,500	45,000	.0383	.0033			
23,000	46,000	.0433	.0050			
23,500	47,000	.0483	.0050			
24,000	48,000	.0517	.0034			
24,500	49,000	.0550	.0033			
25,000	50,000	.0617	.0067			
25,500	51,000	.0667	.0050			
26,000	52,000	.0700	.0033			
26,500	53,000	.0767	.0067			
27,000	54,000	.0833	.0066			
27,500	55,000	.0883	.0050			
28,000	56,000	.0950	.0067			
28,500	57,000	.1000	.0050			
29,000	58,000	.1067	.0067			
29,500	59,000	.1133	.0066			
30,000	60,000	.1200	.0067			
30,500	61,000	.1300	.0100			
31,000	62,000	.1383	.0083			
31,500	63,000	.1467	.0084			
32,000	64,000	.1550	.0083			
32,500	65,000	.1650	.0100			
33,000	66,000	.1783	.0133			
33,500	67,000	.1867	.0084			
34,000	68,000	.2000	.0133			
34,500	69,000	.2167	.0167			
34,840	69,680					Tensile strength.

## General summary.

Specific gravity .....	7.6292
Hardness, under pressure of 10,000 pounds .....	8.09
Tensile strength per square inch of original section .....	69,680 pounds
Elastic limit per square inch of original section .....	19,000 inch
Elongation per inch after rupture .....	do. 2067
Elongation per inch under strain at elastic limit .....	do. .001200
Reduction in diameter at point of rupture .....	do. .028
Reduction in area after rupture, per centum of original section .....	6.8
Position of rupture .....	at neck
Character of broken surface, light yellow color, uniformly fine silky. Five radial cracks extending in a longitudinal direction a maximum length of ".7 were developed at the place of rupture. These cracks began to open at 50,000 pounds per square inch stress. The walls of the cracks were smooth. 1".5 from the end opposite the fracture the specimen was drawn down to ".70 diameter.	
Elongation of inch sections .....	".25, ".27, ".21, ".18, ".16, ".17*

## 10 PER CENT. ALUMINUM BRONZE.

No. 4192.

Marks, 5-10.

Diameter, ".795.

Sectional area, .496 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
495	1,000	0.	0.	0.	0.	Initial load.
2,485	5,000	.000250	.000250	0.	0.	
4,960	10,000	.000583	.000333	0.	0.	
7,440	15,000	.000933	.000350	.000033	.000033	
7,936	16,000	.001033	.000100	-----	-----	
8,432	17,000	.001100	.000067	-----	-----	
8,928	18,000	.001200	.000100	-----	-----	
9,424	19,000	.001300	.000100	-----	-----	
9,920	20,000	.001383	.000083	.000150	.000117	
10,416	21,000	.001467	.000084	-----	-----	
10,912	22,000	.001633	.000166	-----	-----	Elastic limit (approximate).
11,408	23,000	.001783	.000150	-----	-----	
11,904	24,000	.001900	.000117	-----	-----	
12,400	25,000	.002067	.000167	.000480	.000333	
12,896	26,000	.002217	.000150	-----	-----	
13,392	27,000	.002467	.000150	-----	-----	
13,888	28,000	.002800	.000333	-----	-----	
14,384	29,000	.003167	.000367	-----	-----	
14,880	30,000	.003633	.000466	.001567	.001084	
15,376	32,000	.004667	.001084	-----	-----	
16,864	34,000	.005967	.001300	-----	-----	
17,856	36,000	.008017	.002050	-----	-----	
18,848	38,000	.010367	.002350	-----	-----	
19,840	40,000	.013133	.002766	.009467	.007900	
20,832	42,000	.015833	.002700	-----	-----	
21,824	44,000	.019800	.003987	-----	-----	
22,816	46,000	.024367	.004567	-----	-----	Specimen drawing down at each neck.
23,808	48,000	.029333	.004966	-----	-----	
24,800	50,000	.035750	.006417	0.30533	.021066	
25,792	52,000	.0450	.009250	-----	-----	
26,784	54,000	.0517	.0087	-----	-----	
27,776	56,000	.0617	.0100	-----	-----	
28,768	58,000	.0700	.0083	-----	-----	
29,760	60,000	.0817	.0117	-----	-----	
30,752	62,000	.0950	.0133	-----	-----	
31,744	64,000	.1117	.0167	-----	-----	Tensile strength.
32,736	66,000	.1283	.0166	-----	-----	

## General summary.

Specific gravity .....	7.5773
Hardness, under pressure of 4,400 pounds .....	27.99
Tensile strength per square inch of original section .....	pounds.. 66,000
Elastic limit per square inch of original section .....	do.. 21,000
Elongation per inch after rupture .....	inch.. .1217
Elongation per inch under strain at elastic limit .....	do.. .001467
Reduction in diameter at point of rupture .....	do.. .125
Reduction in area after rupture, per centum of original section .....	28.8
Position of rupture .....	2" from neck
Character of broken surface .....	oblique silky, light yellow color
Elongation of inch sections .....	" .21", ".11", ".11, ".10 ".08, ".12

## 10 PER CENT. ALUMINUM BRONZE

No. 4193.

Marks, 6-10.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000267	.000267	0.	0.	
5,000	10,000	.000600	.000333	0.	0.	
7,000	15,000	.000983	.000383	.000083	.000083	
8,000	16,000	.001083	.000100	.....	.....	
8,500	17,000	.001183	.000100	.....	.....	Elastic limit.
9,000	18,000	.001300	.000117	.....	.....	
9,500	19,000	.001450	.000150	.....	.....	
10,000	20,000	.001600	.000150	.000300	.000217	
10,500	21,000	.001733	.000133	.....	.....	
11,000	22,000	.001950	.000217	.....	.....	
11,500	23,000	.002200	.000250	.....	.....	
12,000	24,000	.002517	.000317	.....	.....	
12,500	25,000	.002950	.000433	.001233	.000933	
13,000	26,000	.003333	.000383	.....	.....	
13,500	27,000	.003900	.000567	.....	.....	
14,000	28,000	.004650	.000750	.....	.....	
14,500	29,000	.005317	.000667	.....	.....	
15,000	30,000	.006217	.000900	.003883	.002650	
16,000	32,000	.008217	.002000	.....	.....	
17,000	34,000	.010900	.002683	.....	.....	
18,000	36,000	.014400	.003500	.....	.....	
20,000	40,000	.024300	.009900	.020333	.016450	
21,000	42,000	.029667	.005367	.....	.....	
22,000	44,000	.036500	.006833	.....	.....	
23,000	46,000	.043833	.007333	.....	.....	
24,000	48,000	.052167	.008334	.....	.....	
25,000	50,000	.061667	.009500	.055667	.035334	
26,000	52,000	.0717	.010033	.....	.....	
27,000	54,000	.0817	.0100	.....	.....	
28,000	56,000	.0933	.0116	.....	.....	
29,000	58,000	.1033	.0100	.....	.....	
30,000	60,000	.1167	.0134	.....	.....	
31,000	62,000	.1300	.0133	.....	.....	
32,000	64,000	.1467	.0167	.....	.....	
32,440	64,880	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....pounds.. 64,880  
 Elastic limit per square inch of original section.....do.. 18,000  
 Elongation per inch after rupture.....inch.. .1383  
 Elongation per inch under strain at elastic limit.....do.. .001300  
 Reduction in diameter at point of rupture.....do.. .078  
 Reduction in area after rupture, per centum of original section.....do.. 18.06  
 Position of rupture.....".45 from neck  
 Character of broken surface.....silky, light yellow color. A small hole at center of bar about ".04  
 diameter by ".10 long. In the head of this specimen, near which the fracture occurred, there was  
 a cavity at the center of the metal 1".7 deep, the opposite head had a cavity  $\frac{1}{2}$ " deep.  
 Elongation of inch sections.....".12, ".11, ".16, ".13, ".12, ".19



## 3 PER CENT. ALUMINUM BRASS.

No. 4194.

Marks, 7-3.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000283	.000283	0.	.....	
5,000	10,000	.000617	.000334	0.	.....	
7,500	15,000	.000967	.000350	0.	.....	
8,000	16,000	.001050	.000083	.....	.....	
8,500	17,000	.001133	.000083	.....	.....	
9,000	18,000	.001267	.000134	.....	.....	Elastic limit.
9,500	19,000	.001383	.000116	.....	.....	
10,000	20,000	.001633	.000250	.000217	.000217	
10,500	21,000	.001833	.000200	.....	.....	
11,000	22,000	.002283	.000450	.....	.....	
11,500	23,000	.002833	.000550	.....	.....	
12,000	24,000	.003517	.000684	.....	.....	
12,500	25,000	.004200	.000683	.002117	.001900	
13,000	26,000	.004867	.000467	.....	.....	
13,500	27,000	.005900	.001233	.....	.....	
14,000	28,000	.007300	.001400	.....	.....	
14,500	29,000	.008533	.001233	.....	.....	
15,000	30,000	.010300	.001767	.007467	.005350	
16,000	32,000	.014483	.004183	.....	.....	
17,000	34,000	.019667	.005184	.....	.....	
18,000	36,000	.026367	.006700	.....	.....	
19,000	38,000	.0387	.010333	.....	.....	
20,000	40,000	.0467	.0100	.....	.....	
21,000	42,000	.0550	.0083	.....	.....	
22,000	44,000	.0667	.0117	.....	.....	
23,000	46,000	.0833	.0166	.....	.....	
24,000	48,000	.0967	.0134	.....	.....	
25,000	50,000	.1150	.0183	.....	.....	
26,000	52,000	.1333	.0183	.....	.....	Tensile strength.

## General summary.

Specific gravity.....	8.1589
Hardness, under pressure of 10,000 pounds.....	6.12
Tensile strength per square inch of original section.....	pounds 52,000
Elastic limit per square inch of original section.....	do 17,000
Elongation per inch after rupture.....	inch .1400
Elongation per inch under strain at elastic limit.....	do .001133
Reduction in diameter at point of rupture.....	do .128
Reduction in area after rupture, per centum of original section.....	29.4
Position of rupture.....	"25 from neck
Character of broken surface.....	irregular surface, light yellow, approaching lavender color at the circumference, center of fracture golden yellow.
Elongation of inch sections.....	"12, "12, "12, "12, "12, "12, "24*

## 3 PER CENT. ALUMINUM BRASS.

No. 4195.

Marks, 8-3.

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000283	.000283	0.	0.	
5,000	10,000	.000633	.000350	0.	0.	
7,500	15,000	.001017	.000384	0.	0.	
8,000	16,000	.001153	.000116	.....	.....	
8,500	17,000	.001217	.000084	.....	.....	Elastic limit.
9,000	18,000	.001300	.000083	.....	.....	
9,500	19,000	.001467	.000167	.....	.....	
10,000	20,000	.001633	.000166	.000133	.000133	
10,500	21,000	.001753	.000150	.....	.....	
11,000	22,000	.002017	.000234	.....	.....	
11,500	23,000	.002283	.000266	.....	.....	
12,000	24,000	.002600	.000317	.....	.....	
12,500	25,000	.002900	.000300	.000833	.000700	
13,000	26,000	.003117	.000217	.....	.....	
13,500	27,000	.003667	.000550	.....	.....	
14,000	28,000	.004083	.000416	.....	.....	
14,500	29,000	.004667	.000584	.....	.....	
15,000	30,000	.005217	.000550	.002467	.001634	
16,000	32,000	.006467	.001250	.....	.....	
17,000	34,000	.008683	.002216	.....	.....	
18,000	36,000	.011167	.002484	.....	.....	
19,000	38,000	.015117	.003950	.....	.....	
20,000	40,000	.019000	.003883	.015133	.012666	
21,000	42,000	.024300	.005300	.....	.....	Tensile strength.
22,000	44,000	.031700	.007400	.....	.....	
23,000	46,000	.0400	.0083	.....	.....	
24,000	48,000	.0483	.0083	.....	.....	
25,000	50,000	.0600	.0117	.....	.....	
26,000	52,000	.0717	.0117	.....	.....	
26,120	52,240	.....	.....	.....	.....	

## General summary.

Specific gravity.....	8.0795.
Hardness under pressure of 4,400 pounds.....	27.32
Tensile strength per square inch of original section.....	pounds.. 52,240
Elastic limit per square inch of original section.....	do.. 18,000
Elongation per inch after rupture.....	inch.. .0717
Elongation per inch under strain at elastic limit.....	do.. .001300
Reduction in diameter at point of rupture.....	do.. .058
Reduction in area after rupture, per centum of original section.....	do.. 14.0
Position of rupture.....	".15 from neck
Character of broken surface.....	irregular vesicular surface, in part light lavender color, with part golden yellow color; 50 per cent. each.
Elongation of inch sections.....	".07, ".06, ".06, ".07, ".07, ".10*

## 3 PER CENT. ALUMINUM BRASS.

No. 4196.

Marks, 9-13.

Diameter, .798.

Sectional area, .50 square inch.

Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000317	.000317	0.	0.	
5,000	10,000	.000667	.000350	0.	0.	
7,500	15,000	.001083	.000416	.000017	.000017	
8,000	16,000	.001167	.000084	.....	.....	
8,500	17,000	.001267	.000100	.....	.....	Elastic limit.
9,000	18,000	.001383	.000116	.....	.....	
9,500	19,000	.001533	.000150	.....	.....	
10,000	20,000	.001700	.000167	.000217	.000200	
10,500	21,000	.001867	.000167	.....	.....	
11,000	22,000	.002150	.000283	.....	.....	
11,500	23,000	.002517	.000367	.....	.....	
12,000	24,000	.002817	.000300	.....	.....	
12,500	25,000	.003283	.000466	.001117	.000900	
13,000	26,000	.003533	.000250	.....	.....	
13,500	27,000	.004233	.000700	.....	.....	
14,000	28,000	.004750	.000517	.....	.....	
14,500	29,000	.005417	.000667	.....	.....	
15,000	30,000	.006183	.000766	.003333	.002216	
16,000	32,000	.007917	.001734	.....	.....	
17,000	34,000	.010517	.002600	.....	.....	Crack opened in stem.
18,000	36,000	.014150	.003633	.....	.....	
19,000	38,000	.018300	.004150	.....	.....	
20,000	40,000	.023633	.005333	.....	.....	
21,000	42,000	.0317	.008067	.....	.....	
22,000	44,000	.0383	.0066	.....	.....	Tensile strength.
22,490	44,980	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	44,980
Elastic limit per square inch of original section.....	do..	18,000
Elongation per inch after rupture.....	inch..	.0483
Elongation per inch under strain at elastic limit.....	do..	.001383
Reduction in diameter at point of rupture.....	do..	.088
Reduction in area after rupture, per centum of original section.....		20.8
Position of rupture.....	"	.45 from neck
Character of broken surface.....	irregular, vesicular surface, 60 per cent.; light lavender color, 40 per cent. golden-yellow metal in radial markings. Fracture occurred at a crack observed during progress of test.	
Elongation of inch sections.....	"	.03, ".03, ".04, ".03, ".03, ".13*

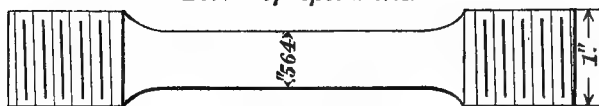
TABULATION OF SPECIMENS OF ALUMINUM AND ALUMINUM BRASS AND BRONZE FROM THE ALUMINUM COMPANY, LIMITED, OLDBURY, NEAR BIRMINGHAM, ENGLAND.

No. of test.	Metal.	Diameter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Contraction of area.	Elongation in 6 inches.	Appearance of fracture.	Elongation of inch section.	Specific gravity.	Hardness.
		Inch.	Sq. inch.	Pounds.	Pounds.	Per ct.	Per ct.		" " " "		
4188	Aluminum	.769	.464	5,000	18,450	34.9	18.7	Silky oblique.	.30* .18 .20 .17 .15 .12	2.7199	\$4.63
4189	do	.768	.488	8,000	18,280	53.1	18.2	do.	.16 .49* .23 .10 .07 .05	2.7242	\$4.25
4190	do	.779	.477	6,000	18,390	28.3	10.5	do.	.07 .09 .07 .08 .10 .23*	7.6292	8.09
4191	10 per cent. aluminum bronze	.798	.50	18,000	69,680	2.8	20.7	Light-yellow color, uniformly fine silky.	.25 .27* .21 .18 .16 .17	7.6292	8.09
4192	do	.795	.486	21,000	66,000	28.8	12.2	Oblique silky, light yellow	.21* .11 .11 .10 .08 .02	7.5773	\$27.99
4193	do	.798	.50	18,000	64,880	16.6	13.8	Silky, light-yellow color; a small hole at center of bar.	.12 .11 .16 .13 .12 .19*	7.5773	6.12
4194	3 per cent. aluminum brass	.798	.50	17,000	52,000	29.4	14.0	Irregular surface, light yellow, approaching lavender color at the circumference; center of fracture golden yellow.	.12 .12 .12 .12 .12 .24*	8.1589	6.12
4195	do	.798	.50	18,000	52,240	14.0	7.2	Irregular vesicular surface, in part light-lavender color and part golden yellow.	.07 .06 .06 .07 .07 .10*	8.0795	\$27.32
4196	do	.798	.50	18,000	44,980	20.8	4.8	Irregular vesicular surface, light-lavender and golden-yellow color.	.03 .03 .04 .03 .03 .03*	8.0795	6.12

\* Hardness determined under pressure of 4,400 pounds.

**TENSILE TEST OF BRONZE SPECIMENS TAKEN FROM FRAGMENT  
OF FRACTURED TRAY HINGE OF 12" B. L. CAST IRON RIFLE.**

*Form of specimens.*



No. 3873.

Diameter, ".564.

Sectional area, .25 square inch.

Elastic limit, 3,120 pounds = 12,480 pounds per square inch.

Tensile strength, 5,540 pounds = 22,160 pounds per square inch.

Elongation in 2 inches, ".23 = 11.5 per cent.

Elongation of inch sections, ".13\*, ".10.

Diameter at fracture, ".51; area, .204 square inch.

Contraction of area, 18.3 per cent.

Fractured at the neck. Appearance, light-yellow color. Opened numerous cracks along surface of stem.

No. 3874.

Diameter, ".564.

Sectional area, .25 square inch.

Elastic limit, 3,200 pounds = 12,800 pounds per square inch.

Tensile strength, 5,290 pounds = 21,160 pounds per square inch.

Elongation in 3 inches, ".30 = 10 per cent.

Elongation of inch sections, ".17\*, ".07, ".06.

Diameter at fracture, ".53; area, .221 square inch.

Contraction of area, 11.8 per cent.

Fractured ".75 from the neck. Appearance, variegated, showing light-yellow, copper-colored, and greenish-brown metal. Opened numerous cracks in the surface of the stem.



---

---

BRASS AND STEEL TAPE

FOR

ENGINEER CORPS, U. S. ARMY. .

---

---





No. 3877.

## BRASS TAPE.

Dimensions,  $.128 \times .0128$ .

Sectional area, .0016 square inch.

Gauged length, 6".

Tested with broad faces in a vertical plane.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
20	.....	0.	0.	
30	.....	.0036	.0001	
40	.....	.0064	.0012	
60	.....	.0164	.0046	
60	.....	.0157	.....	
40	.....	.0104	.0050	
Tape now tested with broad face in an horizontal plane.				
20	.....	0.	0.	Micrometer reset to zero.
30	.....	.0028	0.	
40	.....	.0048	.0006	
50	.....	.0080	.0011	
60	.....	.0120	.0015	
70	.....	.0157	.0030	
80	.....	.0225	.0063	Tensile strength.
90	.....	.0411	.0217	
96	60 000	.....	.....	

No. 3878.

## STEEL TAPE.

Dimensions,  $''\text{.129} \times ''\text{.0130}$ .

Sectional area, .0017 square inch.

Gauged length, 6''.

Tested with broad face in an horizontal plane.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
20	.....	0.	0.	Initial load.
30	.....	.0021	.0007	
40	.....	.0034	.0006	
50	.....	.0048	.0005	
60	.....	.0063	.0005	
70	.....	.0074	.0009	
80	.....	.0090	.....	
90	.....	.0104	.....	
100	.....	.0117	.0016	
110	.....	.0136	.....	
120	.....	.0152	.....	
130	.....	.0166	.....	
140	.....	.0177	.....	
150	.....	.0192	.0018	
160	.....	.0209	.....	
170	.....	.0220	.....	
180	.....	.0232	.....	
190	.....	.0246	.....	
200	.....	.0261	.0023	
210	.....	.0281	.....	
220	.....	.0296	.....	
230	.....	.0306	.....	
240	.....	.0321	.....	
260	.....	.0348	.....	
280	.....	.0376	.....	
300	.....	.0403	.0036	
387	227, 650	.....	.....	Tensile strength.

---

---

ALTERNATE STRAINING, BY TENSION AND COMPRESSION,  
OF  
STEEL, WROUGHT-IRON, AND CAST-IRON BARS.

Continued from Report of Tests, 1889.

Cast-iron specimens taken from condemned 12-inch mortar body, No. 1.



No. 2760.

Midvale steel bar marked  $L_3^{\text{SB}_1}\text{M}$ —first specimen.

(See Report of Tests, 1889, for the first part of this test.)

Rested 10 days, then annealed by heating in muffle over gas burners.

97.9881

**10.0268**

2830.11

## Expansion

**Estimated temperature of annealing 652° F.**

**Test renewed 10 days after annealing.**

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
<b>Pounds.</b>	<b>Pounds.</b>	<b>Inch.</b>	<b>Inch.</b>	<b>Inch.</b>	<b>Inch.</b>	<b>Inch.</b>	<b>Inch.</b>	<b>Inch.</b>	<b>Inch.</b>	
0	0									
70,680	10,000					.00154	.00035	.00119		
141,360	20,000					.00185	.00031			
212,040	30,000					.00217	.00032			
282,720	40,000					.00248	.00031			
353,400	50,000					.00280	.00031			
424,080	60,000					.00311	.00032			
494,760	70,000					.00343	.00031			
565,440	80,000					.00374	.00031			
636,120	90,000					.00406	.00031			
706,800	10,000					.00154	.00031	.00119	0.	
777,480	20,000									
848,160	30,000									
918,840	40,000									
989,520	50,000									
1,060,200	60,000									
1,130,880	70,000									
1,201,560	80,000									
1,272,240	90,000									
1,342,920	10,000									
1,413,600	20,000									
1,484,280	30,000									
1,554,960	40,000									
1,625,640	50,000									
1,696,320	60,000									
1,767,000	70,000									
1,837,680	80,000									
1,908,360	90,000									
1,979,040	10,000									
2,049,720	20,000									
2,120,400	30,000									
2,191,080	40,000									
2,261,760	50,000									
2,332,440	60,000									
2,403,120	70,000									
2,473,800	80,000									
2,544,480	90,000									
2,615,160	10,000									
2,685,840	20,000									
2,756,520	30,000									
2,827,200	40,000									
2,897,880	50,000									
2,968,560	60,000									
3,039,240	70,000									
3,109,920	80,000									
3,180,600	90,000									
3,251,280	10,000									

## No. 2760—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.		Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	
70,680	10,000	—	—	—	—	.00150	—	.00115	.00115	
70,680	10,000	—	+	—	—	—	—	—	0.	
141,360	20,000	—	.00049	—	.00030	—	—	—	—	
212,040	30,000	—	.0013	—	.00036	—	—	—	—	
282,720	40,000	+	.00019	—	.00032	—	—	—	—	
318,060	45,000	—	.00035	—	.00016	—	—	—	—	
282,720	40,000	—	.00021	—	.00014	—	—	—	—	
212,040	30,000	—	.00013	—	.00034	—	—	—	—	
141,360	20,000	—	.00046	—	.00033	—	—	—	—	
70,680	10,000	—	.00077	—	.00031	—	—	—	—	
325,128	46,000	+	.00040	—	.00112	—	—	—	—	
332,196	47,000	—	.00043	—	.00003	—	—	—	—	
339,264	48,000	—	.00047	—	.00004	—	—	—	—	
346,332	49,000	—	.00051	—	.00004	—	—	—	—	
353,400	50,000	—	.00057	—	.00006	—	—	—	—	
70,680	10,000	—	—	—	.00004	—	—	—	—	
141,360	20,000	—	—	—	—	.00142	.00199	.00107	.00001	
212,040	30,000	—	—	—	—	.00173	.00031	.00110	.00003	
282,720	40,000	—	—	—	—	.00208	.00035	.00111	.00001	
353,400	50,000	—	—	—	—	.00240	.00032	.00112	.00001	
353,400	50,000	—	—	—	—	.00274	.00034	.00115	.00003	
353,400	50,000	—	.00060	—	.00034	—	—	—	—	
353,400	50,000	—	.00065	—	.00340	.00275	.00335	.00115	.00012	
353,400	50,000	—	.00072	—	.00347	.00275	.00340	.00113	.00015	
353,400	50,000	—	.00073	—	.00001	—	—	—	—	
353,400	50,000	—	—	—	.00092	.00275	0.	.00112	.00020	
353,400	50,000	—	—	—	—	.00274	.00348	.00111	.00026	
353,400	50,000	—	.00082	—	.00085	—	—	—	—	
353,400	50,000	—	.00093	—	.00075	—	—	—	—	
353,400	50,000	—	.00095	—	.00071	—	—	—	—	
353,400	50,000	—	.00100	—	.00095	—	—	—	—	
353,400	50,000	—	.00100	0.	0.	—	—	—	—	
353,400	50,000	—	.00100	—	.00071	—	—	—	—	
360,468	51,000	—	.00012	—	.00012	—	—	—	—	
367,536	52,000	—	.00034	—	.00034	—	—	—	—	
367,536	52,000	—	.00187	—	.00021	—	—	—	—	
141,360	20,000	—	—	—	.00013	.00093	.00280	.00030	.00017	
212,040	30,000	—	—	—	—	.00143	.00030	.00045	.00015	

333,400	50,000	.00165	.00437	—	.00010	.00035	.00272	.00029	.00105	.00080
333,400	50,000	.00247	.00082							
374,604	53,000	.00305	.00058							
381,672	54,000	.00305	.00011							
333,400	50,000	.00294	—							
282,720	40,000	.00250	.00034							
212,040	30,000	.00225	—							
141,360	20,000	.00190	.00035							
70,680	10,000	.00152	—							
141,360	20,000		.00038		.00110	.00120	—	.00068	.00100	.00010
212,040	30,000						—	.00048	—	.00017
70,680	10,000	.00085	.00136		.00052	.00002	+	.00068	—	.00033
141,360	20,000	.00125	.00037		.00055	.00002				
212,040	30,000	.00165	.00040		.00060	.00005				
282,720	40,000	.00213	.00048		.00072	.00012				
333,400	50,000	.00273	.00060		.00092	.00020				

This load sustained 2 hours.

Test discontinued.

No. 2762.

Midvale steel bar marked N<sup>191</sup> First specimen.

(See report 1889 for the first part of this test.)

Rested 3 months and 20 days, then annealed.

Gauged length cold..... "9.9560

Gauged length hot..... 10.0296

Expansion ..... ".0736

Estimated annealing temperature, 1180° F., which was maintained 2 hours. Test resumed 9 days after annealing.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Micrometer reset.
0	0	—	—	—	—	—	—	—	—	
70,680	10,000	—	.00054	—	.00004	.00465	.00025	.00440	—	
141,360	20,000	—	.00028	—	0.	.00491	.00026	—	—	
212,040	30,000	—	.00033	—	.00003	.00519	.00027	—	—	
282,720	40,000	—	.00306	—	.00001	.00550	.00031	—	—	
212,040	30,000	—	—	—	—	.00518	—	—	—	
141,360	20,000	—	—	—	—	.00493	.00032	—	—	
70,680	10,000	—	—	—	—	.00025	—	—	—	
70,680	10,000	—	.00401	—	.00004	.00465	.00023	.00440	0.	
141,360	20,000	—	.00373	—	0.	—	—	—	—	
212,040	30,000	—	.00339	—	.00003	.0034	.00033	—	—	
282,720	40,000	—	.00306	—	.00001	.00434	—	—	—	
282,720	40,000	—	.00305	.00248	.00005	.00553	.00247	.00439	.00005	
318,060	45,000	—	.00292	.00013	.00003	—	—	—	—	
318,060	45,000	—	.00286	.00006	.00005	.00586	.00274	.00439	.00008	
318,060	45,000	—	.00286	.00280	.00006	—	—	—	—	
325,128	46,000	—	.00280	.00006	—	—	—	—	—	
322,196	47,000	—	.00278	.00002	.00008	—	—	—	—	
339,264	48,000	—	.00277	.00001	—	.00431	—	—	—	
346,332	49,000	—	.00271	.00006	—	—	—	—	—	
353,400	50,000	—	.00266	.00005	.00002	—	—	—	—	
353,400	50,000	—	.00266	.00005	.00002	.00586	.00320	.00440	.00011	
70,680	10,000	—	.00397	.00189	—	—	—	—	—	
141,360	20,000	—	.00367	.00030	—	—	—	—	—	

Considerable scale started off sur-  
face of bar.



										After 2 minutes.									
212,040	30,000	—	.00330	.00037	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	.00298	.00032	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
353,400	50,000	—	.00263	.00035	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	.02295	.00032	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
212,040	30,000	—	.00322	.00027	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	.00353	.00033	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70,680	10,000	—	.00386	.00033	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	.00362	.00026	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	.00297	.00065	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	.00357	.00060	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70,680	10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
212,040	30,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
353,400	50,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
212,040	30,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70,680	10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
353,400	50,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
380,468	51,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
387,530	52,000	—	.00258	.00211	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
353,400	50,000	—	.00247	.00111	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70,680	10,000	—	.00220	.00084	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	.00223	.00060	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
212,040	30,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70,680	10,000	—	.00205	.00175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	.00165	.00040	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
212,040	30,000	—	.00100	.00065	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
282,720	40,000	—	.00013	.00087	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70,680	10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
141,360	20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
353,400	50,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Test again discontinued.

No. 2763.

Bar marked, N<sup>191</sup> second specimen.

(See Report 1889 for the first part of this test.)

Test resumed after resting 3 months and 21 days without load.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Micrometer reset.
0	0	0.	0.	.00380						
70, 680	10, 000	.00409	.00029							
141, 360	20, 000	.00442	.00034							
212, 040	30, 000	.00477	.00035							
282, 720	40, 000	.00513	.00036							
353, 400	50, 000	.00551	.00038							
282, 720	40, 000	.00518	—	.00033						
212, 040	30, 000	.00485	—	.00033						
141, 360	20, 000	.00449	.00036							
70, 680	10, 000	.00417	.00032	.00385	.00005					
0	0									
70, 680	10, 000					.00349	.00068	.00002		
141, 360	20, 000					— .00297	.00052	.00019		
212, 040	30, 000					— .00210	.00087	.00053		
282, 720	40, 000					— .00043	.00167	.00131		
282, 720	40, 000	.00384	.00341	.00244	.00064					
70, 680	10, 000					— .00210	.00174	.00003		
141, 360	20, 000					— .00167	.00057	.00008		

Micrometer reset.

Preparatory to annealing, two additional gauged lengths were laid off on stem 120° distant on either side of the original length. These sections were measured before and after annealing with the following results.

Number of gauged length.	Before annealing.	After annealing.	Difference.
1.....	<i>Inches.</i> 10.0015	<i>Inches.</i> 10.0013	<i>Inch.</i> - .0002
2.....	9.9977	9.9979	+ .0002
3.....	9.9945	9.9948	+ .0003
Means .....	9.9979	9.9980	+ .0001

The annealing was done by heating the bar in an oil bath. The temperature gradually brought up to 278° F., and then slowly cooled.

After annealing the bar was rested a period of 1 month and 17 days, and test was then resumed.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.		Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	
0		0.	0.	0.	0.	0.	0.	0.	0.	Micrometer reset to zero.
70, 680										
70, 680		.00039	.00081	.00001	.00001	.00042	.00042	0.	0.	
106, 620										
106, 620		.00052	.00107	.00001	.00001	.00055	.00094	0.	.00001	
141, 360										
141, 360		.00073	.00139	.00002	.00002	.00066	.00118	0.	.00001	
176, 700										
176, 700		.00090	.00171	.00001	0.	.00081	.00154	— .00001	.00001	
212, 040										
212, 040		.00109	.00208	.00002	.00001	.00089	.00189	— .00001	0.	
247, 380										
247, 380		.00127	.00240	.00003	.00001	.00113	.00222	— .00002	0.	
282, 720										
282, 720		.00144	.00273	.00002	.00002	.00139	.00256	0.	.00003	
318, 060										
318, 060		.00162	.00310	.00005	.00005	.00148	.00292	0.	.00002	
353, 400										
353, 400		.00187	.00363	.00017	.00025	.00176	.00338	.00008	.00013	
386, 468										
386, 468						.00198	.00385			
397, 536						.00213	.00415			
374, 604						.00312	.00599	.00184	.00151	
70, 680										
106, 620		.00085	.00227	— .00123	.00011					
15, 000		— .00060	.00025	— .00114	.00009					
20, 000		— .00036	.00024	— .00106	.00008					
141, 360										
141, 360		.00022	.00191	— .00085	.00028	.00179	.00343	.00113	.00007	
212, 040										
212, 040		.00099	.00339	— .00043	.00063	.00195	.00217	.00098	.00013	
282, 720						.00210	.00046	.00108	.00008	
353, 400		.00213	.00114	+ .00032	.00075					
353, 400						.00298	.00511	.00127	.00159	
374, 604		.00280	.00578							
381, 672						.00350	.00070			
388, 740		.00400	.00050	.00195						
70, 680						— .00142	.00258	— .00177	.00018	
388, 740		.00419	.00277	.00215	.00038					

Test discontinued.

No. 2765.

Midvale steel bar marked S B<sup>3</sup> Second specimen.  
 (See Report 1889 for the first part of this test.)  
 Rested 3 months and 14 days, then annealed.  
 Gauged length, cold ..... 10'' 06.24  
 Gauged length, hot ..... 10'' 09.97

Expansion..... '' 05.73

Estimated annealing temperature 597°O, which was maintained 6 hours.  
 Test resumed 12 days after annealing.

Applied loads.		Under tensile stress.				Under compression stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Inch. 0.	Successive.	Total. Inch. 0.0024	Successive. Inch. 0.0002	Total. Inch. — .00596	Successive. Inch. 0.0028	Total. Inch. — .00624	Successive. Inch. 0.	
Pounds. 0	Pounds. 0									Micrometer reset.
70 680	10 000									
70 680	10 000									
141 360	20 000									
141 360	20 000									
141 360	20 000									
212 040	30 000									
212 040	30 000									
282 720	40 000									
282 720	40 000									
318 060	45 000									
318 060	45 000									
333 400	50 000									
333 400	50 000									
388 740	55 000									
388 740	55 000									
395 808	56 000									
402 876	57 000									
409 944	58 000									
70 680	10 000									
141 360	20 000									
70 680	10 000									
141 360	20 000									
212 040	30 000									

## No. 2765—Continued.

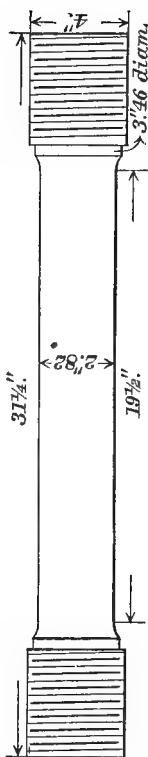
Applied loads.		Under tensile stress.				Under compression stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
212, 040	30, 000	.00738	.00287	.00537	.00039	— .00451	.00219	— .00558	.00007	
282, 720	40, 000	.00829	.00388	.00650	.00078	— .00441	.00297	— .00572	.00025	
353, 400	50, 000	.00915	.00486	.00715	.00065	— .00324	.00591	— .00515	.00200	
388, 740	55, 000	.01103	.00679	.00825	.00310	— .00305	.00723	— .00500	.00325	
388, 740	55, 000	.01028	.00625	.00825	.00310	— .00305	.00723	— .00500	.00325	After 3 minutes.
388, 740	55, 000	.01107	.00802	.00921	.00326	— .00326	.00822	— .00326	.00326	
388, 740	55, 000	.01136	.00808	.00938	.00316	— .00316	.00810	— .00316	.00810	
388, 740	55, 000	.01142	.00806	.00938	.00315	— .00315	.00801	— .00315	.00801	
388, 740	55, 000	.01146	.00804	.00938	.00311	— .00311	.00804	— .00311	.00804	
388, 740	55, 000	.01148	.00802	.00938	.00310	— .00310	.00801	— .00310	.00801	
388, 740	55, 000	.01186	.00825	.00989	.00480	— .00308	.00802	— .00509	.00429	
388, 740	55, 000	.01251	.00909	.01062	.00517	— .00342	.00854	— .00545	.00444	
388, 740	55, 000	.01278	.00927	.01062	.00517	— .00367	.00911	— .00571	.00491	
388, 740	55, 000	.01314	.00947	.01098	.00527	— .00387	.00927	— .00592	.00506	
388, 740	55, 000	.01345	.00958	.01131	.00539	— .00417	.00928	— .00619	.00512	
388, 740	55, 000	.01383	.00966	.01165	.00546	— .00422	.00961	— .00627	.00538	
388, 740	55, 000	.01410	.00983	.01198	.00567	— .00452	.00979	— .00640	.00574	
388, 740	55, 000	.01431	.00993	.01214	.00587	— .00455	.00990	— .00660	.00573	
388, 740	55, 000	.01445	.01008	.01233	.00593	— .00455	.00990	— .00660	.00573	
388, 740	55, 000	.01478	.01023	.01263	.00603	— .00455	.00990	— .00660	.00573	
388, 740	55, 000	.01478	.01023	.01263	.00603	— .00455	.00990	— .00660	.00573	

After resting 16 hours.											
388,740	55,000	.01512	.01048	.01295	.00624	—	.00464	.01014	—	.00571	.00592
388,740	55,000										
388,740	55,000	.01548	.01068	.01325	.00841	—	.00480	.01032	—	.00684	.00611
388,740	55,000										
388,740	55,000	.01571	.01078	.01353	.00855	—	.00493	.01055	—	.00698	.00627
388,740	55,000										
388,740	55,000	.01603	.01101	.01383	.00874	—	.00502	.01069	—	.00709	.00644
388,740	55,000										
388,740	55,000	.01620	.01082	.01402	.00862	—	.00598	.01065	—	.00740	.00642
70,680	10,000										
141,360	20,000										
212,040	30,000										
70,680	10,000	.01347	.00150	.01309	.00005	—	.01197	.00993	—	.01304	.00058
141,360	20,000	.01387	.00040	.01312	.00003	—		.00268	—	.01385	.00017
212,040	30,000	.01432	.00045	.01320	.00008	—		.00268	—	.01357	.00028
353,400	50,000	.01655	.00223	.01498	.00118	—		.00993	—		
70,680	10,000	.01478	.00177								
141,360	20,000	.01513	—								
212,040	30,000	.01552	.00039								
282,720	40,000	.01590	.00038								
353,400	50,000	.01634	.00044								
282,720	40,000	.01598	.00036								
212,040	30,000	.01560	.00038								
141,360	20,000	.01523	.00037								
70,680	10,000	.01484	.00039	.01442	.00004	—					

No. 5085.

## WROUGHT-IRON BAR, PREVIOUSLY STRAINED BY TENSION.

Form of specimens.



Maximum tensile stress of original test, 49,380 pounds per square inch. Specimen now threaded, stem dressed over and tested by alternate stresses.

Interval of rest between original and present tests, 9 years 7 months.

Sectional area, 6.246 square inches.

Gauged length, 10".

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.	
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.			
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.		
											Inch. 0.
<i>Pounds.</i> 0	<i>Pounds.</i> 0										Initial load.
6,246	1,000	.00002	.00002								
31,230	5,000	.00013	.00011								
62,460	10,000	.00030	.00017	0.	0.						
93,690	15,000	.00047	.00017	0.	0.						
124,920	20,000	.00063	.00016	0.	0.						
6,246	1,000					.00004	.00067	— .00001	— .00001		
31,230	5,000					.00019	.00036	0.	0.		
62,460	10,000					.00036	.00052	0.	0.		
93,690	15,000					.00052	.00068	0.	0.		
124,920	20,000					.00068		0.	0.		
156,150	25,000	.00065	.00133	0.	0.						
156,150	25,000	.00084	.00019	0.	0.	.00084	.00178	0.	0.		



187,380	30,000	.00100	.00184	0.		.00104	.00204	.00003	.00003
187,380	30,000	.00098	.00202	.00003	0.				
187,380	30,000	.00115	.00017	.00003	0.				
218,610	35,000								
218,610	35,000					.00129	.00244	.00012	.00009
124,920	20,000	.00055	.00184	.00010	.00002				
187,380	30,000	.00080	.00035	.00010	0.				
218,610	35,000	.00109	.00019	.00009	.00001				
224,856	36,000	.00111	.00002						
231,102	37,000	.00116	.00005						
237,348	38,000	.00119	.00003						
243,594	39,000	.00124	.00005						
249,840	40,000	.00127	.00003	.00001		.00132	.00259		
218,610	35,000					.00161	.00019		
237,348	38,000					.00169	.00018	.00032	.00024
249,840	40,000								
124,920	20,000	.00054	.00203	.00033	.00001				
187,380	30,000	.00072	.00038	.00030					
249,840	40,000	.00115	.00043	.00024	.00006				
256,086	41,000	.00117	.00002						
262,332	42,000	.00120	.00003						
268,578	43,000	.00125	.00005						
274,824	44,000	.00130	.00005						
281,070	45,000	.00133	.00003	.00021	.00003				
287,316	46,000	.00140	.00007						
293,562	47,000	.00143	.00003						
299,808	48,000	.00148	.00005						
306,054	49,000	.00152	.00004						
312,300	50,000	.00157	.00005	.00013	.00008	.00086	.00248	.00037	.00004
124,920	20,000					.00128	.00012	.00026	.00003
187,380	30,000					.00172	.00044	.00042	.00016
249,840	40,000					.00240	.00068	.00085	.00043
281,070	45,000								
62,460	10,000	.00052	.00188	.00080	.00005				
124,920	20,000	.00015	.00037	.00078	.00002				
187,380	30,000	.00025	.00040	.00080	.00002				
249,840	40,000	.00075	.00050	.00063	.00017				
312,300	50,000	.00141	.00066	.00039	.00024				
312,300	50,000	.00140	.00061	.00037	.00002				
62,460	10,000					.00072	.00212	.00040	.00003
124,920	20,000					.00113	.00041	.00044	.00004
187,380	30,000					.00156	.00045	.00056	.00012
249,840	40,000					.00211	.00053	.00075	.00019
281,070	45,000					.00245	.00084	.00092	.00017
62,460	10,000		.00187						
124,920	20,000	.00058	.00011						
187,380	30,000	.00076	.00017						
249,840	40,000	.00074	.00043						
312,300	50,000	.00136	.00062	.00041	.00051				







Micrometer replaced on longitudinal gauged length of 10", and observations renewed on direct tensile and compressive strains.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	
0	0	0.	0.	—	—	0.	0.	0.	0.	
85,500	5,000	.00025	.00025	.00002	.00002	.00023	.00073			
171,000	10,000	.00050	.00025			.00413	.00025			
85,500	5,000		.00025			.00073	.00015			
171,000	10,000					.00150	.00032			
256,500	15,000					.00027	—	.00003	.00003	
171,000	10,000					.00027	0.			
85,500	5,000					.00050	.00033			
85,500	5,000					.00073	.00005			
171,000	10,000					.00078	.00005			
256,500	15,000					.00090	.00012			
273,600	16,000					.00103	.00013			
307,800	18,000					.00103	.00013			
342,000	20,000					.00079	—	.00024	.00024	
256,500	15,000					.00056	—	.00023	—	
171,000	10,000					.00032	—	.00009	.00006	
85,500	5,000		.00027							
17,100	1,000	—	.00005							
34,200	2,000	+	.00002							
51,300	3,000		.00003							
68,400	4,000		.00007							
85,500	5,000		.00012							
102,600	6,000		.00018							
119,700	7,000		.00024		.00002					
136,800	8,000		.00028							
153,900	9,000		.00031							
171,000	10,000		.00041							
85,500	5,000		.00047							
17,100	1,000		.00022		.00003					
34,200	2,000		—	.00004		.00007	.00029			
51,300	3,000					.00012	.00005			
68,400	4,000					.00017	.00005			
85,500	5,000					.00022	.00005	.00004	.00001	
102,600	6,000					.00027	.00005			
119,700	7,000					.00032	.00003			
						.00036	.00004			

## No. 5086—Continued.

Applied loads.		Under tensile strength.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	Per square inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	
136,800	8,000					.0041	.00005			
153,800	9,000					.0047	.00006			
153,900	9,000					.0052	.00005	.00008	.00004	
171,000	10,000					.0057	.00005			
188,100	11,000					.0062	.00005			
205,200	12,000					.0067	.00005			
222,300	13,000					.0072	.00005			
239,400	14,000					.0077	.00005	.00010	.00002	
256,500	15,000					.0082	.00005			
273,600	16,000					.0083	.00011			
307,800	18,000					.0105	.00012	.00015	.00005	
342,000	20,000					.0107	.00002	.00013	—, .00002	
342,000	20,000					.0107	0.	.00013	0.	
342,000	20,000	.00044	.00151	—, .00006	.00907					
171,000	10,000					.0105	.00149	.00012	.00006	
342,000	20,000									

Micrometer taken from longitudinal gauged length and placed across the specimen transversely in order to measure the lateral contraction or expansion of the metal when under tensile and compressive stresses.  
Gauged length, 4".

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Contraction per inch.		Permanent set per inch.		Expansion per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
0	0	0.	0.	0.	0.	0.	0.	0.	0.	
85,500	5,000	.000050	.000050							
171,000	10,000	.000100	.000050	0.						
85,500	5,000									
171,000	10,000					.000075	.000175			
256,500	15,000					.000125	.000050			
342,000	20,000					.000200	.000075			
171,000	10,000					.000250	.000050	.000025	.000025	
342,000	20,000					.000250	.000325	0.	—, 000025	





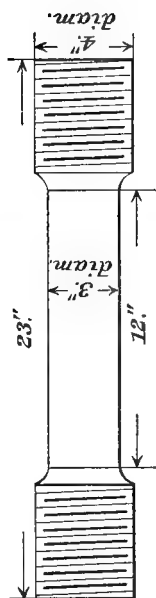
[illegible]

Micrometer now placed across the specimen transversely for the purpose of measuring the lateral contraction or expansion under tensile and compressive stresses.  
Gauged length, 4".

[illegible]

No. 5088.

Cast (gun) iron from Builders' Iron Foundry. Marks, 1b.



Sectional area, 7.068 square inches.  
Gauged length, 10".

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Initial load.
0	0	0.	0.	0.	0.	0.	0.	0.	0.	
7,068	1,000	.00005	.00005			.00003	.00023			
14,136	2,000	.00009	.00004			.00007	.00004			
21,204	3,000	.00013	.00013			.00015	.00005			
28,272	4,000	.00016	.00003			.00015	.00003			
35,340	5,000	.00020	.00004	0.		.00020	.00005	0.		
7,068	1,000					.00003	.00023			
14,136	2,000					.00007	.00004			
21,204	3,000					.00015	.00005			
28,272	4,000					.00015	.00003			
35,340	5,000					.00020	.00005			
42,408	6,000	.00019	.00039							
49,476	7,000	.00024	.00004			.00004	.00004			
56,544	8,000	.00028	.00005			.00005	.00005			
63,612	9,000	.00033	.00005			.00033	.00003			
70,680	10,000	.00038	.00003			.00038	.00005			
70,680	10,000	.00045	.00007	.00005	.00003					
42,481	6,000					.00022	.00007			
49,549	7,000					.00025	.00005			
56,617	8,000					.00032	.00004			
63,685	9,000					.00044	.00012	0.		.00003
70,753	10,000							0.		.00003











## No. 5088—Continued.

[illegible]



[illegible]

## No. 5088—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Total.	Per square inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	
<i>Pounds.</i>	<i>Pounds.</i>									
176,700	25,000					.00577	.00030			
212,040	30,000					.00627	.00150			
247,380	35,000					.00682	.00155			
282,720	40,000					.00742	.00160			
318,060	45,000					.00817	.00175			
353,400	50,000					.00812	.00195			
388,488	51,000					.00950	.00188			
397,536	52,000					.00980	.00230			
374,604	54,000					.01023	.00143			
381,672	54,000					.01103	.00040			
398,740	55,000					.01183	.00184			
353,400	50,000					.01170	.00033			
318,060	45,000					.01148	.00123			
282,720	40,000					.01125	.00053			
247,380	35,000					.01101	.00024			
212,040	30,000					.01077	.00024			
176,700	25,000					.01051	.00026			
141,360	20,000					.01025	.00026			
106,020	15,000					.00998	.00027			
70,680	10,000					.00968	.00030			
35,340	5,000					.00935	.00033	.00894	.00243	
35,340	5,000		.00088		.01024					
70,680	10,000		.00059		.00036					
106,020	15,000		.00093		.0006					
141,360	20,000		.00145		.00092					
176,700	25,000		.00177							
212,040	30,000		.00227							
247,380	35,000		.00270							
282,720	40,000		.00330							
318,060	45,000		.00480		.00480					
353,400	50,000		.00511		.00544					
353,400	50,000									
70,680	10,000					.00582	.00071	.00553	.00009	
106,020	15,000					.00622	.00040	.00622	.00011	
141,360	20,000					.00665	.00043	.00664	.00016	
176,700	25,000					.00710	.00045	.00680	.00018	
212,040	30,000					.00757	.00047	.00719	.00021	
247,380	35,000					.00805	.00048	.00642	.00023	
282,720	40,000					.00857	.00052	.00670	.00028	
318,060	45,000					.00915	.00058	.00702	.00032	
						.00983	.00068	.00745	.00044	



## No. 5088—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
318,060	45,000	.....	.....	.....	.....	.01500	.00023	.....	.....	
282,720	40,000	.....	.....	.....	.....	.01477	— .00073	.....	.....	
247,380	35,000	.....	.....	.....	.....	.01454	.00023	.....	.....	
212,040	30,000	.....	.....	.....	.....	.01430	— .00074	.....	.....	
176,700	25,000	.....	.....	.....	.....	.01405	.00025	.....	.....	
141,360	20,000	.....	.....	.....	.....	.01377	.00028	.....	.....	
176,700	25,000	.....	.....	.....	.....	.01399	+ .00022	.....	.....	
141,360	20,000	.....	.....	.....	.....	.01377	— .00022	.....	.....	
176,700	25,000	.....	.....	.....	.....	.01399	+ .00022	.....	.....	
141,360	20,000	.....	.....	.....	.....	.01376	.00023	.....	.....	
106,020	15,000	.....	.....	.....	.....	.01349	— .00027	.....	.....	
141,360	20,000	.....	.....	.....	.....	.01370	+ .00071	.....	.....	
106,020	15,000	.....	.....	.....	.....	.01347	.00023	.....	.....	
141,360	20,000	.....	.....	.....	.....	.01370	+ .00023	.....	.....	
106,020	15,000	.....	.....	.....	.....	.01347	— .00023	.....	.....	
70,680	10,000	.....	.....	.....	.....	.01316	— .00031	.....	.....	
35,340	5,000	.....	.....	.....	.....	.01281	— .00035	.....	.....	.01240 — .00136
35,340	5,000	.....	.....	.....	.....	.01262	— .00019	.....	.....	.01236 — .00004
35,340	5,000	.....	.....	.....	.....	.01262	0.	.....	.....	.01235 — .00001 Test discontinued.

---

---

## SPECIMENS TAKEN FROM STEM OF OVERSTRAINED STEEL EYEBAR.

Interval between test of eyebar and test of the specimens, 3 years 3 months.

Original elastic limit 34,390 pounds per square inch. Maximum stress applied 54,350 pounds per square inch, which stretched the metal 5.5 per cent.

Odd numbers were finished and tested without annealing. Even numbers were annealed.

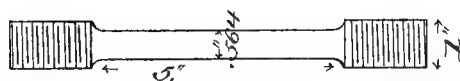
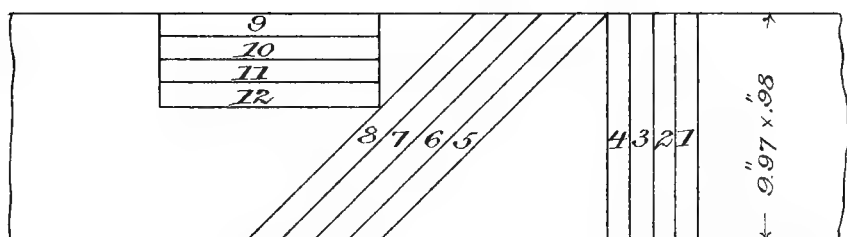
The annealing was done by heating cherry red and cooling between pine boards.

---

---



*Sketch showing location of specimens  
in stem of steel eye bar.*



H Ex. 165 51 2





## TENSION TESTS.

No. 2929.

Mark, 1.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 5".

Not annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0006	-----	
2,500	10,000	.0016	0.	
3,750	15,000	.0023	-----	
5,000	20,000	.0032	0.	
6,250	25,000	.0040	-----	
7,500	30,000	.0049	.0002	
8,750	35,000	.0058	-----	
10,000	40,000	.0069	.0005	
11,250	45,000	.0101	.0030	
11,500	46,000	.0114	-----	
11,750	47,000	.0129	-----	
12,000	48,000	.0158	-----	
12,250	49,000	.0180	-----	
12,500	50,000	.0223	.0138	
13,000	52,000	.0331	-----	
13,500	54,000	.0470	-----	
14,000	56,000	.0638	-----	
14,500	58,000	.0825	-----	
15,000	60,000	.1032	-----	
15,500	62,000	.16	-----	Tensile strength. = 12 per cent.
16,000	64,000	.18	-----	
16,500	66,000	.27	-----	
16,580	66,320	-----	-----	
0	0	.60	-----	

Elongation of inch sections, ".08, ".22, \* ".15, ".09, ".06.

Fractured 1".95 from the neck. Appearance, silky serrated.

Diameter at fracture, ".49. Area, .189 square inch.

Contraction, 24.6 per cent.

H. Ex. 165—46

No. 2930.

Marks, 2.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 5".

Annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0005	-----	
2,500	10,000	.0015	0.	
3,750	15,000	.0023	-----	
5,000	20,000	.0032	.0001	
6,250	25,000	.0040	-----	Elastic limit.
7,500	30,000	.0049	.0001	
8,750	35,000	.0056	-----	
10,000	40,000	.0066	.0001	
10,250	41,000	.0113	-----	
10,500	42,000	.0995	-----	
10,750	43,000	.1031	-----	
11,000	44,000	.1140	-----	
11,250	45,000	.1210	.1131	
11,500	46,000	.1360	-----	
12,000	48,000	.17	-----	
12,500	50,000	.20	-----	
13,000	52,000	.22	-----	
13,500	54,000	.27	-----	
14,000	56,000	.31	-----	
14,500	58,000	.39	-----	
15,000	60,000	.48	-----	
15,500	62,000	.66	-----	Tensile strength. =22 per cent.
15,790	63,160	.96	-----	
0	0	1.10	-----	

Elongation of inch sections, ".16, ".20, ".23, ".28, ".23\*.

Fractured 1".05 from the neck. Appearance, silky serrated. Opened cracks in surface of stem.

Diameter at fracture, ".46. Area, .166 square inch.

Contraction, 33.5 per cent.

No. 2931.

Marks, 5.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 5".

Not annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0005	-----	
2,500	10,000	.0015	0.	
3,750	15,000	.0025	-----	
5,000	20,000	.0032	0.	
6,250	25,000	.0041	-----	
7,500	30,000	.0050	.0001	
8,750	35,000	.0058	-----	
10,000	40,000	.0069	.0002	
11,250	45,000	.0082	.0007	
11,500	46,000	.0089	-----	
11,750	47,000	.0091	-----	
12,000	48,000	.0098	-----	
12,250	49,000	.0103	-----	
12,500	50,000	.0116	.0028	
12,750	51,000	.0127	-----	
13,000	52,000	.0153	-----	
13,250	53,000	.0173	-----	
13,500	54,000	.0205	-----	
14,000	56,000	.0350	-----	
14,500	58,000	.0530	-----	
15,000	60,000	.0765	.0647	Tensile strength. =16. per cent.
15,500	62,000	.10	-----	
16,000	64,000	.14	-----	
16,500	66,000	.21	-----	
16,680	66,780	.35	-----	
0	0	.80	-----	

Elongation of inch sections, ".09, ".45\*, ".15, ".07, ".04.

Fractured 1".70 from the neck. Appearance, fine silky.

Diameter at fracture, ".36. Area, .102 square inch.

Contraction, 59.3 per cent.

No. 2932.

Marks, 6.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 5".

Annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0005	.....	
2,500	10,000	.0013	0.	
3,750	15,000	.0022	.....	
5,000	20,000	.0031	0.	
6,250	25,000	.0039	.....	
7,500	30,000	.0048	0.	
8,750	35,000	.0057	.....	
10,000	40,000	.0067	.0001	
10,500	42,000	.....	.....	
10,000	40,000	.0938	.....	Elastic limit. Sustained momentarily, then yielded rapidly under reduced load.
10,250	41,000	.0947	.....	
10,500	42,000	.0978	.....	
10,750	43,000	.1017	.....	
11,000	44,000	.1150	.....	
11,250	45,000	.1278	.1188	
11,500	46,000	.135	.....	
12,000	48,000	.18	.....	
12,500	50,000	.20	.....	
13,000	52,000	.22	.....	
13,500	54,000	.27	.....	
14,000	56,000	.32	.....	
14,000	58,000	.40	.....	
15,000	60,000	.50	.....	
15,500	62,000	.70	.....	
15,710	62,840	1.05	.....	
0	0	1.38	.....	

Tensile strength.  
= 27.5 per cent.

Elongation of inch sections, ".17, ".22, ".54, \* ".24, ".21.

Fractured, 3" from the neck. Appearance, fine silky.

Diameter at fracture, ".35. Area, .096 square inch.

Contraction, 61.5 per cent.

No. 2933.

Marks, 9.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 5".

Not annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004		
2,500	10,000	.0013	0.	
3,750	15,000	.0022		
5,000	20,000	.0030	0.	
6,250	25,000	.0039		
7,500	30,000	.0048	0.	
8,750	35,000	.0056		
10,000	40,000	.0065	0.	
11,250	45,000	.0073		
12,500	50,000	.0083	.0001	
12,750	51,000	.0084		
13,000	52,000	.0086		
13,250	53,000	.0088		
13,500	54,000	.0090		
13,750	55,000	.0092	.0001	
14,000	56,000	.0094		
14,250	57,000	.0095		
14,500	58,000	.0099		
14,750	59,000	.0101		
15,000	60,000	.0103	.0003	
15,250	61,000	.0105		
15,500	62,000	.0109		
15,750	63,000	.0113		
16,000	64,000	.0119		
16,250	65,000	.0124	.0013	
16,500	66,000	.0329		
16,750	67,000	.0687		
17,000	68,000	.1038	.0893	
	7,000	.0898		
	10,000	.0908		
	15,000	.0918		
	20,000	.0928		
	25,000	.0938		
	30,000	.0948		
	35,000	.0958		
	40,000	.0968		
	45,000	.0979		
	50,000	.0990		
	45,000	.0981		
	40,000	.0972		
	35,000	.0962		
	30,000	.0953		
	25,000	.0942		
	20,000	.0932		
	15,000	.0922		
	10,000	.0912		
	5,000	.0902	.0892	
17,250	69,000	.1117		
17,500	70,000	.1697		
17,750	71,000	.20		
18,000	72,000	.29		
18,360	73,440	.52		
0	0	.00		Tensile strength. =18 per cent.

Elongation of inch sections, ".07, ".10, ".13, ".43\*, ".17.  
 Fractured 1".60 from the neck. Appearance, fine silky.  
 Diameter at fracture, ".35. Area, .096 square inch.  
 Contraction, 61.5 per cent.

No. 2934.

Marks, 10.

Diameter, ".564

Sectional area, .25 square inch.

Gauged length, 5".

Annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	.....	
2,500	10,000	.0013	0.	
3,750	15,000	.0022	.....	
5,000	20,000	.0032	0.	
6,250	25,000	.0040	.....	
7,500	30,000	.0049	0.	
8,750	35,000	.0057	0.	
10,000	40,000	.0067	0.	
11,250	45,000	.0073	0.	
11,500	46,000	.0077	.....	Elastic limit. Sustained load momentarily, then yielded rapidly and load fell.
11,750	47,000	.....	.....	
10,250	41,000	.0253	.....	
10,500	42,000	.0525	.....	
10,750	43,000	.1295	.....	
11,000	44,000	.1392	.....	
11,250	45,000	.1447	.....	
11,500	46,000	.1548	.....	
12,000	48,000	.1840	.....	
12,500	50,000	.22	.....	
13,000	52,000	.26	.....	Tensile strength. =26 per cent.
13,500	54,000	.30	.....	
14,000	56,000	.35	.....	
14,500	58,000	.41	.....	
15,000	60,000	.50	.....	
15,500	62,000	.62	.....	
16,000	64,000	.90	.....	
0	0	1.30	.....	

Elongation of inch sections, ".18, ".36, ".40\*, ".19, ".17.

Fractured 3".70 from the neck. Appearance, fine silky.

Diameter at fracture, ".35. Area, .096 square inch.

Contraction, 61.5 per cent.

## COMPRESSION TESTS.

No. 2935.

## CROSSWISE SPECIMEN.

Marks, 3.

Length, 9".

Diameter, ".926.

Sectional area, .673 square inch.

Gauged length, 5".

Not annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
673	1,000	0.	0.	Initial load.
3,365	5,000	.0006	-----	
6,730	10,000	.0012	0.	
10,095	15,000	.0021	-----	
13,460	20,000	.0027	0.	
16,825	25,000	.0036	-----	
20,190	30,000	.0043	0.	
23,555	35,000	.0051	-----	
26,920	40,000	.0062	.0001	
27,593	41,000	.0065	-----	
28,266	42,000	.0066	-----	
28,939	43,000	.0069	-----	
29,612	44,000	.0071	-----	
30,285	45,000	.0074	.0005	
30,958	46,000	.0075	-----	
31,631	47,000	.0077	-----	
32,304	48,000	.0080	-----	
32,977	49,000	.0085	-----	
33,650	50,000	.0090	.0011	
34,323	51,000	.0093	-----	Ultimate strength.
34,996	52,000	.0101	-----	
35,669	53,000	.0113	-----	
36,342	54,000	.0124	-----	
37,015	55,000	.0146	.0054	
37,688	56,000	.0176	-----	
38,361	57,000	.0228	-----	
39,034	58,000	.0620	.0503	
39,100	58,100	-----	-----	

Failed by triple flexure.

No. 2936.

## CROSSWISE SPECIMEN.

Marks, 4.

Length, 9".

Diameter, ".942.

Sectional area, .697 square inch.

Gauged length, 5".

Annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Persquare inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
697	1,000	0.	0.	Initial load.
3,485	5,000	.0006	-----	
6,970	10,000	.0013	0.	
10,455	15,000	.0022	-----	
13,940	20,000	.0029	0.	
17,425	25,000	.0037	-----	
20,910	30,000	.0045	0.	
24,395	35,000	.0053	-----	
27,880	40,000	.0060	0.	
28,577	41,000	.0062	-----	
29,274	42,000	.0065	-----	Ultimate strength and elastic limit.
29,971	43,000	-----	-----	

Failed by triple flexure.

No. 2937.

## DIAGONAL SPECIMEN.

Marks, 7.

Length, 9".

Diameter, ".926.

Sectional area, .673 square inch.

Gauged length, 5".

Not annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Persquare inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
673	1,000	0.	0.	Initial load.
3,365	5,000	.0006	-----	
6,730	10,000	.0013	0.	
10,095	15,000	.0021	-----	
13,460	20,000	.0028	0.	
16,825	25,000	.0035	-----	
20,190	30,000	.0043	0.	
23,555	35,000	.0051	-----	
26,920	40,000	.0061	0.	
27,593	41,000	.0065	-----	
28,266	42,000	.0068	-----	Specimen deflects upward.
28,939	43,000	.0071	-----	
29,612	44,000	.0075	-----	
30,285	45,000	.0081	.0011	
30,958	46,000	.0088	-----	
31,631	47,000	.0095	-----	
32,304	48,000	.0107	-----	
32,977	49,000	.0121	-----	
33,650	50,000	.0135	.0055	
34,323	51,000	.0146	-----	
34,996	52,000	.0150	-----	Ultimate strength.
35,669	53,000	.0143	-----	
36,342	54,000	.0225	-----	
36,600	54,380	-----	-----	

Failed by triple flexure.



No. 2938.

## DIAGONAL SPECIMEN.

Marks, 8.  
 Length, 9".  
 Diameter, ".935.  
 Sectional area, .687 square inch.  
 Gauged length, 5".  
 Annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
687	1,000	0.	0.	Initial load.
3,435	5,000	.0008	-----	
6,870	10,000	.0015	0.	
10,305	15,000	.0023	-----	
13,740	20,000	.0031	.0001	
17,175	25,000	.0038	-----	
20,610	30,000	.0047	.0001	
24,045	35,000	.0055	-----	
27,480	40,000	.0063	.0002	
28,167	41,000	.0066	-----	
28,854	42,000	.0070	-----	Ultimate strength.
29,541	43,000	-----	-----	

Failed by triple flexure.

No. 2939.

## LENGTHWISE SPECIMEN.

Marks, 11.  
 Length, 9".  
 Diameter, ".915.  
 Sectional area, .658 square inch.  
 Gauged length, 5".  
 Not annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
658	1,000	0.	0.	Initial load.
3,290	5,000	.0005	-----	
6,580	10,000	.0013	0.	
9,870	15,000	.0020	-----	
13,160	20,000	.0028	.0002	
16,450	25,000	.0035	-----	
19,740	30,000	.0043	.0004	
23,030	35,000	.0053	-----	
26,320	40,000	.0112	.0052	
26,978	41,000	.0130	-----	
27,638	42,000	.0155	-----	Ultimate strength.
28,294	43,000	.0180	-----	
28,952	44,000	.0189	-----	
29,610	45,000	.0196	.0125	
32,200	48,940	-----	-----	

Failed by triple flexure.

No. 2940.

## LENGTHWISE SPECIMEN.

Marks, 12.

Length, 9".

Diameter, ".933.

Sectional area, .684 square inch.

Gauged length, 5".

Annealed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
0.84	1,000	0.	0.	Initial load.
3,420	5,000	.0006	.....	
6,840	10,000	.0014	.....	
10,260	15,000	.0021	.....	
13,680	20,000	.0029	.....	
17,100	25,000	.0037	.....	
20,520	30,000	.0045	.....	
23,940	35,000	.0054	.....	
27,360	40,000	.0063	.....	
28,044	41,000	.0065	.....	
28,728	42,000	.0067	.....	
29,412	43,000	.1068	.....	Elastic limit.
30,780	45,000	.....	.....	Ultimate strength.

Failed by triple flexure.

TABULATION OF SPECIMENS TAKEN FROM OVERSTRAINED STEEL EYEBAR.

## TENSION SPECIMENS.

No. of test.	Marks.	How taken.	Condition.	Diameter.	Sec-tional area.	Elastic limit per square inch.	Ultimate strength per square inch.	Elongation in 5 inches.	Area of fracture.	Con- traction of area.	Appearance of fracture.	Elongation of inch sections.
2929	1	Crosswise.....	Not annealed.	Inch. .564	Sq. inch. .25	Pounds. ....	Pounds. 66,320	Per cent 12.0	" Sq. in. Diam., .49 = .159	Per ct. 24.6	Silky serrated.....	" " " .08, .22*, 15, .09, .06
2930	2	do.....	Annealed.....	.564	.25	40,000	63,160	22.0	Diam., .46 = .166	33.5	do.....	.16, .20, .23, .28, .23*
2931	5	Diagonally.....	Not annealed.....	.564	.25	40,000	66,760	16.0	Diam., .36 = .102	59.3	Fine silky.....	.09, .45*, 15, .07, .04
2932	6	do.....	Annealed.....	.564	.25	42,000	62,840	27.5	Diam., .35 = .096	61.5	do.....	.17, .22, .54*, .24, .21
2933	9	Lengthwise.....	Not annealed.....	.564	.25	42,000	73,440	18.0	Diam., .35 = .096	61.5	do.....	.07, .10, .13, .43*, .17
2934	10	do.....	Annealed.....	.564	.25	47,000	64,000	26.0	Diam., .35 = .096	61.5	do.....	.18, .36, .40*, .19, .17

## COMPRESSION SPECIMENS.

2935	3	Crosswise.....	Not annealed.....	.926	.673	.....	58,100	.....	.....	.....	.....	.....
2936	4	do.....	Annealed.....	.942	.697	43,000	43,000	.....	.....	.....	.....	.....
2937	7	Diagonally.....	Not annealed.....	.926	.673	54,360	54,360	.....	.....	.....	.....	.....
2938	8	do.....	Annealed.....	.933	.697	.....	43,000	.....	.....	.....	.....	.....
2939	11	Lengthwise.....	Not annealed.....	.915	.638	.....	48,940	.....	.....	.....	.....	.....
2940	12	do.....	Annealed.....	.933	.684	45,000	45,000	.....	.....	.....	.....	.....

The compression specimens failed by triple flexure.



---

# INITIAL STRAINS IN STEEL

FROM

8-INCH AND 12-INCH B. L. RIFLES.

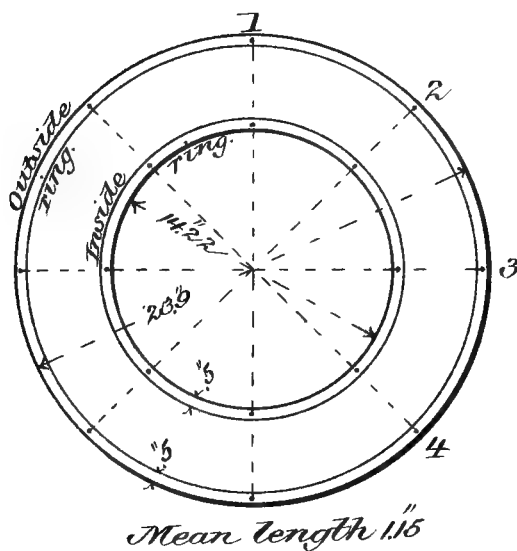
Slices from 8-inch jacket and tube forgings. Also slice from 12-inch hoop, A<sub>1</sub>.

---

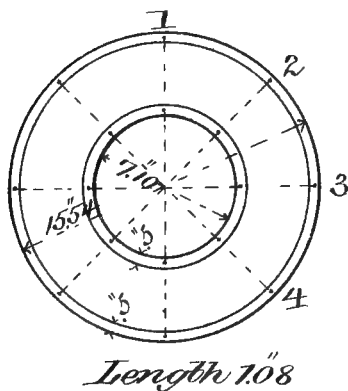


# 8 inch B.L. Rifle Steel.

## Stice from Jacket.



## Stice from Tube.







No. 4345.

MEASUREMENT OF RINGS FROM SLICE TAKEN FROM BREECH END OF  
JACKET, 8-INCH B. L. RIFLE.

## OUTSIDE RING.

Ring.	Diameters.				
	1	2	3	4	Mean.
In slice .....	<i>Inches.</i> 23.4229	<i>Inches.</i> 23.4402	<i>Inches.</i> 23.4393	<i>Inches.</i> 23.4137	<i>Inches.</i> 23.4290
Detached .....	23.4212	23.4473	23.4456	23.4112	23.4313
Differences .....	-.0017	+.0071	+.0063	-.0025	+.0023

## INSIDE RING.

In slice .....	14.7637	14.7437	14.7625	14.7501	14.7550
Detached .....	14.7650	14.7443	14.7630	14.7520	14.7561
Differences .....	+.0013	+.0006	+.0005	+.0019	+.0011

Stresses corresponding to above mean strains.

Outside ring, 2,950 pounds per square inch compression.

Inside ring, 2,240 pounds per square inch compression.

No. 4346.

MEASUREMENT OF RINGS FROM SLICE TAKEN FROM TUBE, 8-INCH  
B. L. RIFLE.

## OUTSIDE RING.

Ring. .	Diameters.				
	1	2	3	4	Mean.
In slice .....	<i>Inches.</i> 15. 0339	<i>Inches.</i> 15. 0343	<i>Inches.</i> 15. 0106	<i>Inches.</i> 15. 0198	<i>Inches.</i> 15. 0246
Detached .....	15. 0391	15. 0347	15. 0090	15. 0205	15. 0258
Differences .....	+ .0052	+ .0004	— .0016	+ .0007	+ .0012

## INSIDE RING.

In slice .....	7. 6173	7. 6194	7. 6234	7. 6189	7. 61975
Detached .....	7. 6179	7. 6193	7. 6238	7. 6190	7. 62000
Differences .....	+ .0006	— .0001	+ .0004	+ .0001	+ .00025

Stresses corresponding to above mean strains.

Outside ring, 2,400 pounds per square inch compression.

Inside ring, 9,840 pounds per square inch compression.

SLICE FROM HOOK A<sub>1</sub>, 12-INCH B. L. RIFLE, STEEL.

The original diameters were : Inside, 33".40 ; outside, 43".75.

The slice was turned down to the given diameters on sketch before the measurements were taken for initial strains.

## OUTSIDE RING.

Ring.	Diameters.				
	1	2	3	4	Mean.
In slice .....	<i>Inches.</i> 42. 8925	<i>Inches.</i> 42. 8920	<i>Inches.</i> 42. 9020	<i>Inches.</i> 42. 8990	<i>Inches.</i> 42. 8964
Detached .....	42. 8942	42. 8899	42. 9491	42. 9417	42. 9187
Differences .....	+ .0017	— .0021	+ .0471	+ .0427	+ .0223

## INSIDE RING.

In slice .....	34. 3167	34. 3255	34. 3236	34. 3157	34. 3204
Detached .....	34. 3606	34. 3500	34. 3407	34. 3397	34. 3503
Differences .....	+ .0439	+ .0345	+ .0171	+ .0240	+ .0299

The gauged diameters for determining the initial strains were established on the inside face of the slice.

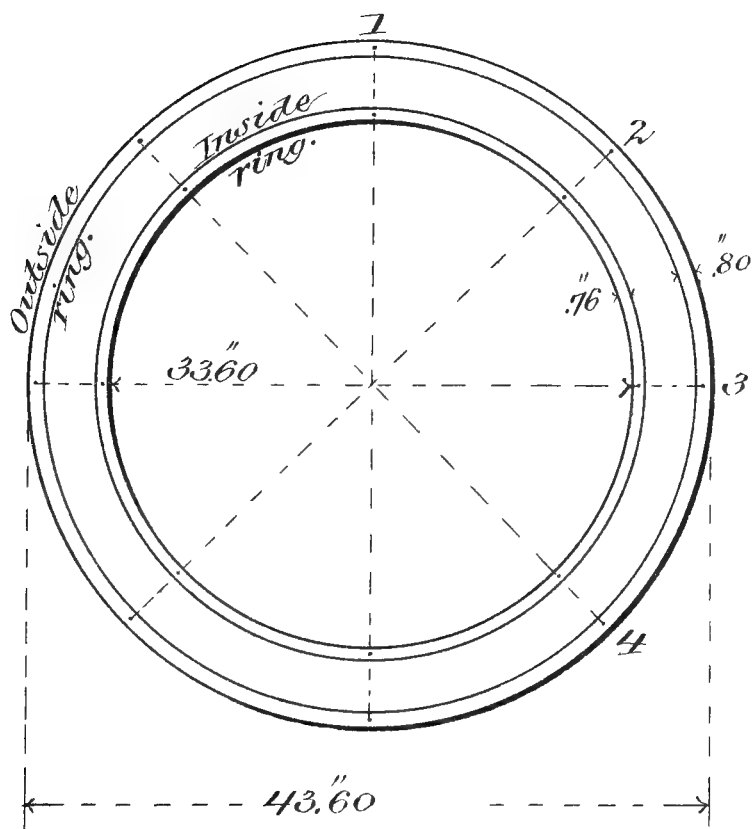
Stresses corresponding to above mean strains.

Outside ring, 15,600 pounds per square inch compression.

Inside ring, 26,140 pounds per square inch compression.

# *12-inch B.L. Rifle Steel.*

*Stice from hoop A1.*



*Length ranges from 1.44 to 1.76*



**CAST IRON FROM WATERTOWN ARSENAL FOUNDRY.**

Specimens 1".129 diameter were tested in the grooved form.

No. of test.		Marks or description.	Diam-eter.	Sectional area.	Tensile strength.	
					Total.	Per square inch.
2057	From same 3" 2 shell.....	<i>Inches.</i> .505	<i>Sq. inch.</i> .20	<i>Pounds.</i> 7, 010	<i>Pounds.</i> 35, 050	
2058		.505	.20	7, 020	35, 100	
2059		.505	.20	6, 989	34, 900	
2080	Pig of remelted Dyer projectiles.....	1.129	1.00	16, 980	16, 980	
2090		1.129	1.00	26, 670	26, 670	
2091	Pig of remelted 8 and 9 inch Butler projectiles.....	Top of pig, Bottom of pig.		27, 480	27, 480	
2092				25, 170	25, 170	
Specimens cast from same crucible of metal; those marked F. were cast with silica or Al. flux; those marked O. cast without flux.						
2993	O.	1.129	1.00	27, 820	27, 820	
2994	O.	1.129	1.00	25, 410	25, 410	
2995	F.	1.129	1.00	24, 080	24, 080	
2996	F.	1.129	1.00	23, 040	23, 040	
2997	F.	1.129	1.00	29, 500	29, 500	
3000	F.	1.129	1.00	29, 060	29, 060	
3001	O.	1.129	1.00	29, 050	29, 050	
3002	O.	1.129	1.00	28, 980	28, 980	
2997	S. C. 8", C. S.	1.129	1.00	16, 310	16, 310	
2998	S. C. 8", C. S.	1.129	1.00	27, 620	27, 620	
3203	8", C. S.	1.129	1.00	18, 980	18, 980	
3204	8", C. S.	1.129	1.00	26, 190	26, 190	
3205	8", C. S.	1.129	1.00	25, 810	25, 810	
3206	8", C. S.	1.129	1.00	26, 800	26, 800	
3207	8", C. S.	1.129	1.00	28, 550	28, 550	
3208	C. S.	1.129	1.00	31, 470	31, 470	
3209	C. S.	1.129	1.00	31, 090	31, 090	
3210	C. S.	1.129	1.00	30, 950	30, 950	
3211	C. S.	1.129	1.00	31, 600	31, 600	
3212	S. C. W. I. C.	1.129	1.00	30, 600	30, 600	
3213	S. C. W. I. C.	1.129	1.00	29, 450	29, 450	
3214	S. C. S. W. I. C.	1.129	1.00	30, 580	30, 580	
3215	S. C. S. W. I. C.	1.129	1.00	30, 990	30, 990	
3216	C. S.	1.129	1.00	31, 400	31, 400	
3217	C. S.	1.129	1.00	31, 480	31, 480	
3218	W. I. 20	1.129	1.00	28, 980	28, 980	
3219	W. I. 20	1.129	1.00	30, 010	30, 010	
3220	S. C.	1.129	1.00	29, 820	29, 820	
3221	S. C.	1.129	1.00	29, 700	29, 700	
3222	S. C.	1.129	1.00	30, 200	30, 200	
3223	S. C.	1.129	1.00	30, 410	30, 410	
3224	S. C.	1.129	1.00	30, 180	30, 180	
3225	S. C.	1.05	.86	26, 610	30, 940	
3226	S. C.	1.129	1.00	29, 040	29, 040	
3227	S. C.	1.129	1.00	29, 650	29, 650	
3228	S. C.	1.129	1.00	28, 630	28, 630	
3229	S. C.	1.129	1.00	28, 460	28, 460	
3230	S. C.	1.129	1.00	30, 650	30, 650	
3231	S. C.	1.129	1.00	30, 080	30, 080	
3232	S. C.	1.129	1.00	31, 620	31, 620	
3233	S. C.	1.129	1.00	31, 280	31, 280	
4301	S. C.	1.129	1.00	30, 880	30, 880	
4302	S. C.	1.129	1.00	30, 140	30, 140	
4303	S. C.	1.129	1.00	30, 030	30, 030	
4304	S. C.	1.129	1.00	29, 980	29, 980	
4305	S. C.	1.129	1.00	26, 800	26, 800	
4306	S. C.	1.129	1.00	29, 180	29, 180	
4307	S. C.	1.129	1.00	30, 690	30, 690	
4308	S. C.	1.129	1.00	30, 660	30, 660	
4309	S. C.	1.129	1.00	29, 890	29, 890	
4310	S. C.	1.120	1.00	29, 410	29, 410	
4311	S. C.	1.129	1.00	29, 340	29, 340	
4312	S. C.	1.129	1.00	29, 090	29, 090	
4313	S. C.	1.129	1.00	28, 570	28, 570	
4314	S. C.	1.129	1.00	28, 030	28, 030	
4315	S. C.	1.129	1.00	29, 480	29, 480	
4316	S. C.	1.129	1.00	29, 400	29, 400	
4317	S. C.	1.129	1.00	30, 210	30, 210	
4318	S. C.	1.129	1.00	30, 470	30, 470	
4319	S. C.	1.129	1.00	29, 420	29, 420	
4320	S. C.	1.129	1.00	27, 980	27, 980	
4321	S. C.	1.129	1.00	25, 800	25, 800	
4322	S. C.	1.129	1.00	25, 920	25, 920	
4323	S. C.	1.129	1.00	25, 240	25, 240	
4324	S. C.	1.129	1.00	26, 980	26, 980	
4325	S. C.	1.129	1.00	22, 270	22, 270	
4326	S. C.	1.129	1.00	22, 790	22, 790	

**TWO SPECIMENS OF CAST IRON FROM WATERTOWN ARSENAL  
FOUNDRY. ONE SPECIMEN CAST WITHOUT FLUX AND ONE  
WITH ALUMINUM FLUX.**

No. 812.

**SPECIMEN WITHOUT FLUX.**

Length, 3".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0005	.0001	
5,000	10,000	.0022	.0007	
7,500	15,000	.0033	.0008	
10,000	20,000	.0045	.0010	
12,500	25,000	.0056	.0013	
15,000	30,000	.0072	.0018	
17,500	35,000	.0090	.0027	
20,000	40,000	.0115	.0040	
22,500	45,000	.0153	.0068	
25,000	50,000	.0202	.0105	
27,500	55,000	.0270	.0162	
30,000	60,000	.0352	.0228	
44,810	89,620	-----	-----	Ultimate strength.

Failed by triple flexure.

No. 813.

**SPECIMEN WITH ALUMINUM FLUX.**

Length, 5".

Diameter, ".798.

Sectional area, .50 square inch.

Gauged length, 3".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0006	0.	
5,000	10,000	.0016	.0002	
7,500	15,000	.0027	.0002	
10,000	20,000	.0038	.0004	
12,500	25,000	.0050	.0006	
15,000	30,000	.0064	.0010	
17,500	35,000	.0080	.0016	
20,000	40,000	.0107	.0030	
22,500	45,000	.0140	.0053	
25,000	50,000	.0195	.0097	
27,500	55,000	.0265	.0154	
30,000	60,000	.0354	.0235	
43,100	86,200	-----	-----	Ultimate strength.

Failed by triple flexure.

## CAST IRON FROM WATERVLIET ARSENAL.

No. of test.	Mark.	Diameter.	Sectional area.	Tensile strength.		Fracture.
				Total.	Per square inch.	
		<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
3396	11	.505	.20	4,340	21,700	Medium, coarse, granular.
3397	12	.564	.25	8,370	33,480	Fine granular.
3232	.....	.505	.20	5,610	28,050	Granular.
3233	.....	.505	.20	6,090	30,450	Do.
3234	.....	.505	.20	6,130	30,650	Do.
3235	.....	.505	.20	5,980	29,900	Do.
3236	.....	.505	.20	6,100	30,500	Do.
3237	.....	.505	.20	6,130	30,650	Do.

## TENSILE TESTS OF PIG IRONS.

Specimens 1".129 diameter were tested in the grooved form.

No. of test.	Description.	Diameter.	Sectional area.	Tensile strength.	
				Total.	Per square inch.
		<i>Inches.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>
2960	Muirkirk pig	1.129	1.00	32,890	32,890
2961	do	1.129	1.00	31,480	31,480
2966	do	1.129	1.00	23,580	23,580
2967	do	1.129	1.00	24,190	24,190
2985	do	.798	.50	12,570	25,140
2986	do	.798	.50	12,250	24,500
2976	Muirkirk pig, pile 1	1.129	1.00	38,310	38,310
2977	do	1.129	1.00	34,320	34,320
2987	do	.798	.50	15,910	31,820
2978	Muirkirk pig, pile 2	1.129	1.00	22,300	22,300
2979	Muirkirk pig, pile 3	1.129	1.00	30,990	30,990
2980	do	1.129	1.00	29,370	29,370
2988	do	.798	.50	14,620	29,240
2981	Muirkirk pig, pile 4	1.129	1.00	36,870	36,870
2982	do	1.129	1.00	35,900	35,900
2962	Shelby pig	1.129	1.00	16,610	16,610
2963	do	1.129	1.00	15,720	15,720
2968	Katabdin pig	1.129	1.00	24,510	24,510
2969	do	1.129	1.00	28,440	28,440
2974	do	1.129	1.00	32,470	32,470
2975	do	.798	.50	17,140	34,280
2970	Clifton No. 5, pig	1.129	1.00	14,580	14,580
2971	do	1.129	1.00	14,710	14,710
2972	do	1.129	1.00	26,450	26,450
2973	Richmond No. 4, gun iron pig	1.129	1.00	25,810	25,810
2983	do	.798	.50	13,910	27,820
2984	do	.798	.50	13,940	27,880





---

COMPRESSION  
OF  
BELLEVILLE SPRINGS.

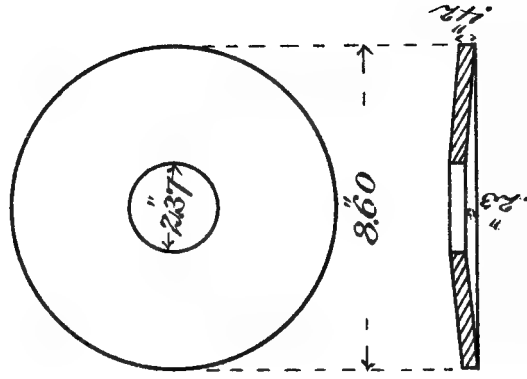
---



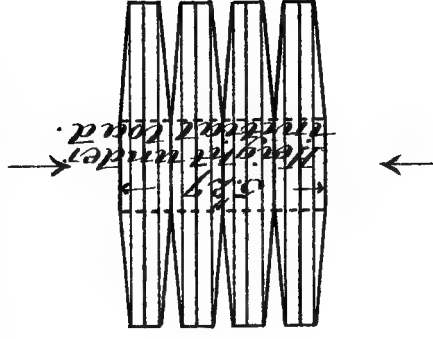


# Belleville Springs, Steel.

Single Spring



Test, No. 3854



HEx 165 51 2

No. 3854.

Four pairs of springs assembled and tested together.

Total height under initial load 5".27.

Measurements showing the compression and recovery of the springs, and permanent sets, were taken between the platforms of the testing machine.

Applied loads.	Compression or recovery.		Permanent compression set.	Remarks.
	Total.	Successive.		
Pounds.	Inch.	Inch.	Inch.	
500	0.	0.	0.	Initial load.
1,000	.0206	.0206	-----	
1,500	.0491	.0285	-----	
2,000	.0703	.0212	.0006	
2,500	.0913	.0210	-----	
3,000	.1120	.0207	-----	
3,500	.1325	.0205	-----	
4,000	.1521	.0196	.0018	
4,500	.1718	.0197	-----	
5,000	.1911	.0193	-----	
5,500	.2108	.0197	-----	
6,000	.2298	.0190	.0013	
6,500	.2497	.0199	-----	
7,000	.2688	.0191	-----	
7,500	.2878	.0190	-----	Rested 15 hours.
8,000	.3083	.0205	.0031	
8,500	.3242	.0159	-----	
9,000	.3468	.0226	-----	
9,500	.3665	.0197	-----	
10,000	.3858	.0193	.0033	
10,500	.4038	.0180	-----	
11,000	.4241	.0203	-----	
11,500	.4440	.0199	-----	
12,000	.4632	.0192	.0044	
12,500	.4833	.0201	-----	
13,000	.5026	.0193	-----	
13,500	.5233	.0207	-----	
14,000	.5420	.0187	.0071	
15,000	.5771	.0351	-----	
16,000	.6164	.0393	.0023	
17,000	.6571	.0407	-----	
18,000	.6984	.0413	.0042	
19,000	.7391	.0407	-----	
20,000	.7815	.0424	.0052	
21,000	.8248	.0433	-----	
22,000	.8684	.0436	.0062	
23,000	.9130	.0446	-----	
24,000	.9583	.0453	.0100	
25,000	1.0041	.0458	-----	
26,000	1.0512	.0471	.0100	
27,000	1.1008	.0496	-----	
28,000	1.1496	.0488	.0136	
29,000	1.1992	.0496	-----	
30,000	1.2524	.0532	.0163	
31,000	1.3057	.0533	-----	
32,000	1.3580	.0523	.0188	
33,000	1.4129	.0549	-----	
34,000	1.4642	.0513	.0250	
35,000	1.5182	.0540	-----	
36,000	1.5672	.0492	.0327	
37,000	1.6139	.0467	-----	
38,000	1.6464	.0325	.0407	
39,000	1.6708	.0244	-----	
40,000	1.6872	.0164	.0498	
41,000	1.7051	.0179	-----	
42,000	1.7120	.0069	-----	
43,000	1.7189	.0069	-----	
44,000	1.7261	.0072	.0598	
60,000	-----	-----	.0734	
70,000	-----	-----	.0845	
10,000	.4735	1.2526	-----	
20,000	.8840	.3105	-----	
30,000	1.3561	.4721	-----	
35,000	1.5936	.2375	-----	
40,000	1.7069	.1133	.0871	

Springs removed from machine and allowed to rest 24 days; then again assembled as before and retested.

## No. 3854—Continued.

Applied loads.	Compression or recovery.		Permanent compression set.	Remarks.
	Total.	Successive.		
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	0.	0.	0.	
4,000	.1505	.1505	.....	
8,000	.3131	.1626	.....	
12,000	.4698	.1567	.....	
16,000	.6388	.1090	.....	
20,000	.8095	.1707	.....	
24,000	.9877	.1782	.....	
28,000	1.1840	.1963	.....	
32,000	1.3873	.2033	.....	
36,000	1.5647	.1774	.....	
40,000	1.6457	.0810	.....	
44,000	1.6840	.0383	.....	
48,000	1.7045	.0205	.....	
52,000	1.7181	.0136	.....	
48,000	1.7085	.0096	.....	
44,000	1.6926	.0159	.....	
40,000	1.6667	.0259	.....	
36,000	1.6201	.0466	.....	
32,000	1.5010	.1191	.....	
28,000	1.3448	.1562	.....	
24,000	1.1758	.1690	.....	
20,000	1.0000	.1758	.....	
16,000	.8255	.1745	.....	
12,000	.6446	.1809	.....	
8,000	.4494	.1952	.....	
4,000	.3424	.1070	.0374	
4,000	.1848	.1576	.....	
8,000	.3492	.1642	.....	
12,000	.5110	.1618	.....	
16,000	.6771	.1861	.....	
20,000	.8445	.1674	.....	
24,000	1.0240	.1795	.....	
28,000	1.2190	.1950	.....	
32,000	1.4182	.1992	.....	
36,000	1.5838	.1656	.....	
40,000	1.6554	.0716	.....	
36,000	1.6031	.0523	.....	
32,000	1.4872	.1159	.....	
36,000	1.5983	.1111	.....	
40,000	1.6550	.0567	.....	
36,000	1.6050	.0500	.....	
32,000	1.4889	.1161	.....	
28,000	1.3344	.1545	.....	
24,000	1.1685	.1659	.....	After sustaining load 1 hour.
20,000 {	.9952	.1733	.....	
	.9910	.0042	.....	
16,000	.8238	.1672	.....	
12,000	.6420	.1818	.....	
8,000	.4505	.1915	.....	
4,000	.2437	.2068	.0473	
4,000	.1950	.0487	.....	
8,000	.3598	.1648	.....	
12,000	.5198	.1600	.....	
16,000	.6860	.1662	.....	
20,000	.8580	.1720	.....	
24,000	1.0337	.1757	.....	
28,000	1.2345	.2008	.....	
32,000	1.4280	.1935	.....	
36,000	1.5842	.1562	.....	
40,000	1.6560	.0718	.....	
36,000	1.6045	.0515	.....	
32,000	1.4845	.1200	.....	
28,000	1.3353	.1492	.....	
24,000	1.1683	.1670	.....	
20,000	.9954	.1729	.....	
16,000	.8228	.1726	.....	
12,000	.6421	.1807	.....	
16,000	.7930	.1509	.....	
20,000	.9515	.1585	.....	
24,000	1.1178	.1663	.....	
28,000	1.2640	.1462	.....	
32,000	1.4555	.1915	.....	
36,000	1.5934	.1379	.....	
40,000	1.6545	.0611	.....	
36,000	1.6050	.0495	.....	
32,000	1.4910	.1140	.....	
28,000	1.3383	.1527	.....	

No. 3854—Continued.

Applied loads.	Compression or recovery.		Permanent compression set.	Remarks.
	Total.	Successive.		
<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	<i>Inch.</i>	
24,000	1.1712	.1671	.....	
20,000	1.0010	.1702	.....	
16,000	.8228	.1782	.....	
12,000	.6485	.1743	.....	
8,000	.4568	.1917	.....	
4,000	.2524	.2044	.0495	

Loaded ten times with 40,000 pounds, releasing to 8,000 pounds between each maximum load.  
Under the tenth loading the springs remained 15 minutes.

500	.....	.....	.0540	
4,000	.2078	.1538	.....	
8,000	.3723	.1645	.....	
12,000	.5360	.1637	.....	
16,000	.6970	.1610	.....	
20,000	.8657	.1687	.....	
24,000	1.0480	.1823	.....	
28,000	1.2330	.1850	.....	
32,000	1.4324	.1904	.....	
36,000	1.5920	.1598	.....	
40,000	1.6515	.0595	.....	
36,000	1.6080	.0435	.....	
32,000	1.4980	.1100	.....	
28,000	1.3444	.1536	.....	
24,000	1.1762	.1682	.....	
20,000	1.0005	.1757	.....	
16,000	.8335	.1670	.....	
12,000	.6528	.1807	.....	
8,000	.4580	.1945	.....	
4,000	.2526	.2054	.0550	Test discontinued.

Test of one pair of springs.

500	0.	0.	.....	Initial load.
4,000	.0382	.0382	.....	
8,000	.0817	.0435	.....	
12,000	.1247	.0430	.....	
16,000	.1637	.0390	.....	
20,000	.2036	.0399	.....	
24,000	.2437	.0401	.....	
28,000	.2867	.0530	.....	
32,000	.3469	.0502	.....	
36,000	.3920	.0451	.....	
40,000	.4170	.0250	.....	
32,000	.3725	.0445	.....	
28,000	.3330	.0395	.....	
24,000	.2892	.0438	.....	
20,000	.2458	.0434	.....	
16,000	.2012	.0446	.....	
12,000	.1566	.0446	.....	
8,000	.1032	.0534	.....	
4,000	.0547	.0485	.0040	
70,000	.....	.....	.....	This load applied and released.
500	.0087	.....	.....	
4,000	.0462	.0375	.....	
8,000	.0882	.0420	.....	
12,000	.1287	.0405	.....	
16,000	.1717	.0430	.....	
20,000	.2102	.0385	.....	
24,000	.2552	.0450	.....	
28,000	.3035	.0483	.....	
32,000	.3537	.0502	.....	
36,000	.3957	.0420	.....	
40,000	.4200	.0243	.....	
36,000	.4055	.0145	.....	
32,000	.3767	.0288	.....	
28,000	.3347	.0420	.....	
24,000	.2943	.0404	.....	
20,000	.2492	.0451	.....	
16,000	.2037	.0455	.....	
12,000	.1597	.0440	.....	
8,000	.1112	.0485	.....	
4,000	.0571	.0541	.0061	

A disc of brass .025 thickness now placed between the two springs and loads renewed.

## No. 3854—Continued.

Applied loads.	Compression or recovery.		Permanent compression set.	Remarks.
	Total.	Successive.		
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
500	0.	0.	0.	
4,000	.0392	.0392	.....	
8,000	.0807	.0415	.....	
12,000	.1194	.0387	.....	
16,000	.1596	.0402	.....	
20,000	.2031	.0435	.....	
24,000	.2438	.0407	.....	
28,000	.2915	.0477	.....	
32,000	.3405	.0490	.....	
36,000	.3851	.0446	.....	
40,000	.4115	.0264	.....	
36,000	.3982	.0133	.....	
32,000	.3708	.0274	.....	
28,000	.3331	.0377	.....	
24,000	.2909	.0422	.....	
20,000	.2482	.0427	.....	
16,000	.2032	.0450	.....	
12,000	.1580	.0452	.....	
8,000	.1081	.0499	.....	
4,000	.0574	.0507	.0040	



No. 4355.

Five pairs of steel springs assembled and tested together.

Total height of springs under initial load of 500 pounds, 6".10.

Total weight, 54½ pounds.

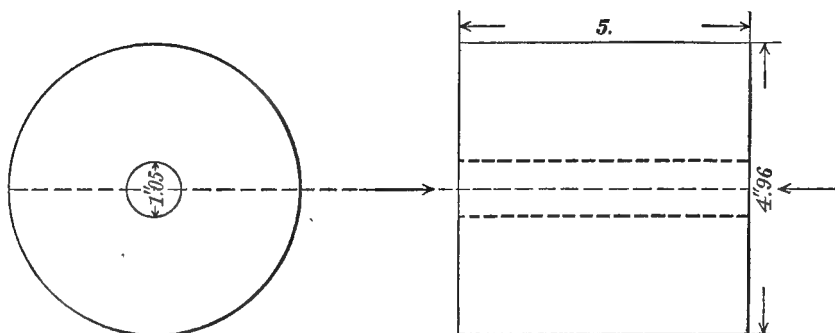
Dimensions of single springs: Exterior diameter, 8".60; diameter of central hole, 2".56; thickness of metal, ".37.

Conicity of spring, ".25.

Applied loads.	Compression or recovery.		Permanent compression set.	Remarks.
	Total	Successive.		
<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	0.	0.	0.	Initial load.
4,000	.293	.293	.....	
8,000	.601	.308	.....	
12,000	.925	.324	.....	
16,000	1.252	.357	.....	
20,000	1.684	.402	.....	
16,000	1.384	.300	.....	
12,000	1.054	.330	.....	
8,000	.719	.335	.....	
4,000	.379	.340	.....	
500			.026	
4,000	.326	.300	.....	
8,000	.637	.311	.....	
12,000	.951	.314	.....	
16,000	1.315	.364	.....	
20,000	1.690	.375	.....	
24,000	1.986	.296	.....	
28,000	2.140	.154	.....	
32,000	2.230	.090	.....	
36,000	2.285	.055	.....	
40,000	2.321	.036	.....	
36,000	2.296	.025	.....	
32,000	2.258	.038	.....	
28,000	2.196	.062	.....	
24,000	1.993	.203	.....	
20,000	1.814	.179	.....	
16,000	1.616	.198	.....	
12,000	1.261	.355	.....	
8,000	.901	.300	.....	
4,000	.506	.395	.....	
500			.117	
12,000	1.051	.....	.....	Load left on springs Saturday night.
11,900	.....	.....	.....	Load on springs Monday morning, after forty hours' rest.
12,000	1.056	.....	.....	
500			.113	
Loaded ten times with 40,000 pounds, releasing to 8,000 pounds between each maximum load. Under the tenth loading the springs remained 15 minutes.				
500			.163	
4,000	.452	.289	.....	
8,000	.777	.325	.....	
12,000	1.094	.317	.....	
16,000	1.471	.377	.....	
20,000	1.835	.364	.....	
24,000	2.061	.226	.....	
28,000	2.181	.120	.....	
32,000	2.251	.070	.....	
36,000	2.293	.042	.....	
40,000	2.322	.029	.....	
36,000	2.300	.022	.....	
32,000	2.263	.037	.....	
28,000	2.204	.059	.....	
24,000	2.111	.093	.....	
20,000	1.949	.162	.....	
16,000	1.667	.282	.....	
12,000	1.316	.351	.....	
8,000	.949	.367	.....	
4,000	.561	.388	.....	
500			.163	

## COMPRESSION OF RUBBER BUFFERS.

No. 4239.



Weight, 6 pounds 4 ounces.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 5,000	<i>Pounds.</i> .....	<i>Inches.</i> 2.21	<i>Inches.</i> .10	After 5 minutes' rest.
10,000	.....	2.86	.10	
20,000	.....	3.28	.20	
.....	.....	.....	.50	After 5 minutes' rest.
.....	.....	.....	.42	

No. 4240.

Weight, 6 pounds 4½ ounces.

Length, 5".00.

Diameters, { Exterior, 4".96.  
                  { Bore, 1".05.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 5,000	<i>Pounds.</i> .....	<i>Inches.</i> 2.03	<i>Inches.</i> .22	After 5 minutes' rest.
10,000	.....	2.75	.18	
20,000	.....	3.23	.43	After 5 minutes' rest.
.....	.....	.....	.36	
.....	.....	.....	.71	After 5 minutes' rest.
.....	.....	.....	.63	

## No. 4241.

Weight, 6 pounds 8½ ounces.

Length, 5".

Diameters, { Exterior, 5".  
Bore, 1".04.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
5,000	.....	1.80	.12	After 5 minutes' rest.
	.....		.08	
10,000	.....	2.59	.28	After 5 minutes' rest.
	.....		.24	
20,000	.....	3.10	.47	After 5 minutes' rest.
	.....		.40	

## No. 4242.

Weight, 6 pounds 8½ ounces.

Length, 5".01.

Diameters, { Exterior, 5".  
Bore, 1".05.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
5,000	.....	1.79	.10	After 5 minutes' rest.
	.....		.07	
10,000	.....	2.61	.27	After 5 minutes' rest.
	.....		.21	
20,000	.....	3.14	.44	After 5 minutes' rest.
	.....		.38	

## No. 4243.

Weight, 6 pounds 3½ ounces.

Length, 5".

Diameters, { Exterior, 4".94.  
Bore, 1".05.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
5,000	.....	2.07	.20	After 5 minutes' rest.
	.....		.14	
10,000	.....	2.76	.37	After 5 minutes' rest.
	.....		.30	
20,000	.....	3.23	.57	After 5 minutes' rest.
	.....		.47	

No. 4267.

Weight, 6 pounds 6 ounces.

Length, 4''.98.

Diameters, { Exterior, 4''.99.  
Bore, 1''.05.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 3, 370	<i>Pounds.</i> .....	<i>Inches.</i> 1. 25	<i>Inch.</i> . 08	After 2½ hours' rest. After 21½ hours' rest. After 24 hours' rest.
.....	.....	.....	. 06	
.....	.....	.....	. 05	
.....	.....	.....	. 04	

No. 4268.

Weight, 6 pounds 5 ounces.

Length, 5''.03.

Diameters, { Exterior, 4''.93.  
Bore, 1''.06.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 3, 285	<i>Pounds.</i> .....	<i>Inches.</i> 1. 26	<i>Inch.</i> . 06	After 2½ hours' rest. After 21½ hours' rest. After 24 hours' rest.
.....	.....	.....	. 03	
.....	.....	.....	. 01	
.....	.....	.....	. 01	

No. 4269.

Weight, 6 pounds 8 ounces.

Length, 5''.06.

Diameters, { Exterior, 4''.98.  
Bore, 1''.06.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 6, 710	<i>Pounds.</i> .....	<i>Inches.</i> 2. 10	<i>Inch.</i> . 14	After 2½ hours' rest. After 21½ hours' rest. After 24 hours' rest.
.....	.....	.....	. 07	
.....	.....	.....	. 05	
.....	.....	.....	. 04	

## No. 4270.

Weight, 6 pounds 5 ounces.

Length, 4''.97.

Diameters, { Exterior, 4''.94.  
                  { Bore, 1''.06.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 6,600	<i>Pounds.</i> .....	<i>Inches.</i> 2.07	<i>Inch.</i> .09 .05 .04 .03	After 2½ hours' rest. After 20 hours' rest. After 24 hours' rest.
.....	.....	.....	.....	
.....	.....	.....	.....	
.....	.....	.....	.....	

## No. 4271.

Weight, 6 pounds 5 ounces.

Length, 4''.96.

Diameters, { Exterior, 4''.99.  
                  { Bore, 1''.06.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 13,480	<i>Pounds.</i> .....	<i>Inches.</i> 2.83	<i>Inch.</i> .29 .20 .19 .19	After 2½ hours' rest. After 20 hours' rest. After 24 hours' rest.
.....	.....	.....	.....	
.....	.....	.....	.....	
.....	.....	.....	.....	

## No. 4272.

Weight, 6 pounds 6 ounces.

Length, 5''.01.

Diameters, { Exterior, 4''.99.  
                  { Bore, 1''.06.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 13,480	<i>Pounds.</i> .....	<i>Inches.</i> 2.86	<i>Inch.</i> .33 .24 .23 .23	After 2½ hours' rest. After 20 hours' rest. After 24 hours' rest.
.....	.....	.....	.....	
.....	.....	.....	.....	
.....	.....	.....	.....	

No. 4347.

Weight, 10 pounds 14 ounces.

Length, 6".03.

Diameters, { Exterior, 5".93.  
Bore, 1".18.

Applied loads.		In total length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	Immediate set. After 20 minutes.
5,000	.....	1.27	.01	
10,000	.....	2.29	.03	
20,000	.....	3.21	.11	
.....	.....	.....	.05	

---

---

## QUADRANTS FROM DISCS OF 12-INCH B. L. RIFLED MORTAR BODIES NOS. 12 AND 24.

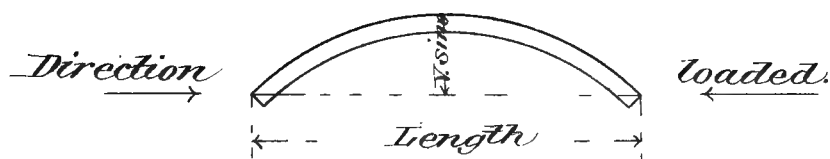
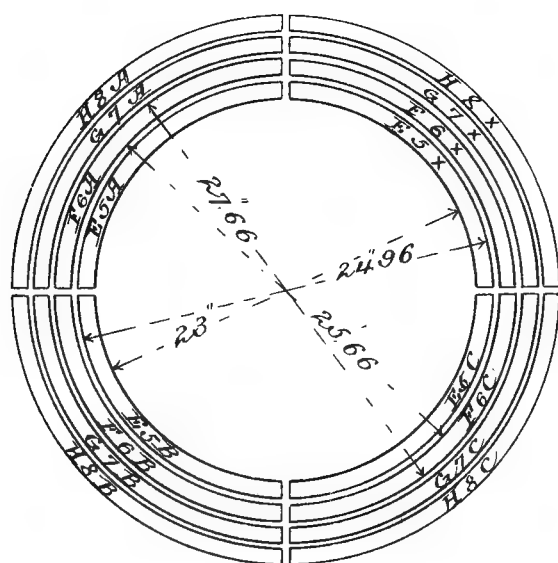
Tested by compressive stress applied in the direction of the chord of the quadrant.  
Length of disc, cast-iron body No. 12, ".75, body No. 24, ".97.





# 12-inch B.L. Rifled Mortars.

Quadrants from C.I. Body No. 24.





QUADRANTS FROM CAST-IRON BODY No. 24.

No. of tests.	Ring and quadrant.	Chord.		Ultimate resistance, total.	Total compression in length of chord between 200 pounds load, and time of rupture.	Thickness of ring at place of rupture.	Location and appearance of fracture.
		Length.	Versed sine.				
4291	H <sup>9</sup> A	Inches. 23.40	Inches. 4.80	Pounds. 2,036	Inches. .....	Inches. 1.05	} Outside skin of white metal ".05 deep.
4292	H <sup>8</sup> B	23.47	4.83	2,093	.50	1.08	
4293	H <sup>3</sup> C	23.40	4.74	1,898	.52	1.00	
4294	H <sup>8</sup> X	23.36	4.82	2,058	.53	1.06	
4295	G <sub>7</sub> A	21.38	4.39	1,985	.52	.99	} Outside skin of white metal ".05 deep.
4296	G <sub>7</sub> B	21.37	4.39	2,095	.58	1.00+	
4297	G <sub>7</sub> C	21.34	4.36	2,132	.58	1.00+	
4298	G <sub>7</sub> X	21.35	4.36	1,992	.54	1.00	
4299	F <sub>6</sub> A	19.47	4.00	2,324	.39	1.02	} Outside skin of white metal ".05 deep.
4300	F <sub>6</sub> B	19.47	3.99	2,188	.40	.99	
4301	F <sub>6</sub> C	19.40	3.96	2,130	.40	.98	
4302	F <sub>6</sub> X	19.49	4.02	2,194	.42	.99	
4303	E <sub>5</sub> A	17.55	3.60	2,423	.31	1.00	} Outside skin of white metal ".05 deep.
4304	E <sub>5</sub> B	17.54	3.58	2,366	.30	.99	
4305	E <sub>5</sub> C	17.54	3.59	2,328	.28	.99	
4306	E <sub>5</sub> X	17.53	3.58	2,391	.29	.99	

QUADRANTS FROM RING E<sub>6</sub>—CAST-IRON BODY No. 12.

No. of tests.	Ring and quadrant.	Chord.		Ultimate resistance, total.	Total compression in length of chord between 200 pounds load, and time of rupture.	Thickness of ring at place of rupture.	Location and appearance of fracture.
		Length.	Versed sine.				
4307	E <sub>5</sub> A	17.20	3.54	2,058	.24	1.00	} Outside skin of white metal ".05 deep.
4308	E <sub>5</sub> B	17.20	3.47	2,198	.28	1.02	
4309	E <sub>5</sub> C	17.22	3.52	2,187	.25	1.02	
4310	E <sub>5</sub> X	17.23	3.52	2,016	.24	1.00	



---

---

**TENSILE TESTS**

**OF**

**SPECIMENS FROM MUCK BAR TENDER AXLES**

**NOS. 7, 8, AND 9.**

**Continuation of tests. See Report, 1888.**

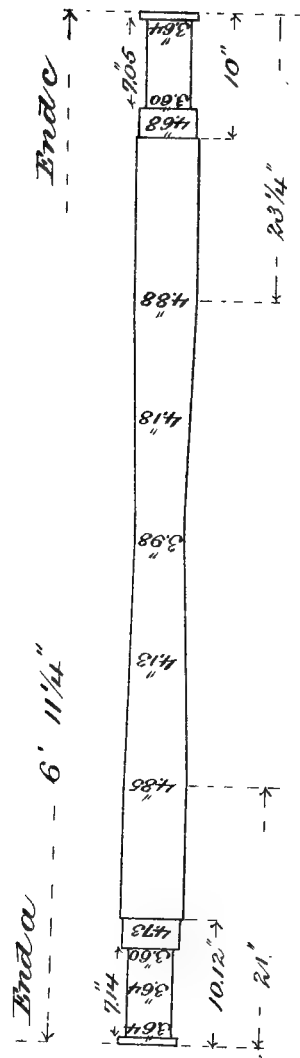
---

---



# Muck bar axle

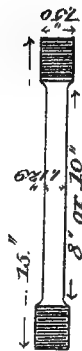
No. 7.



Specimens



Form of specimens.



H Ex No 5 512





Axles Nos. 7 and 8 were run 317,028 miles each, and axle No. 9, 319,229 miles.

When received for testing the journals of the axles were examined for incipient cracks, and their alignment ascertained by mounting upon centers; afterward the axles were cut up and tensile specimens taken, three from each end and three from the middle section of each.

The journals of axle No. 7 presented a slightly mottled appearance, but no cracks were visible. The journals ran out of line at their inner ends when mounted upon centers; end A  $\frac{1}{8}$  inch, and end C  $\frac{1}{16}$  inch, and were bent in the opposite direction.

Journal A of axle No. 8 showed no unusual appearance. Journal C, however, was slightly mottled at the inner end, and there was visible to the unaided eye a fine crack 1.65 inches long, located at the base of the fillet, .16 of an inch from the inside end of the journal.

Mounted upon centers journal A ran out of line .20 of an inch; journal C .18 of an inch, both being bent in the same direction.

The crack in journal C was quartering with the concave side of the bend.

Journal A of axle No. 9 had a mottled appearance, and there was a crack in sight 1.75 inches long visible to the unaided eye. There was also a shorter crack ".25 long on the opposite side of the journal. These cracks were located at the base of the fillet at the inner end of the journal.

Fractured specimen No. 4186 from end C of axle No. 8 displayed a crack on the side which was next the journal-bearing, and in the vicinity of the neck at the inner end of the journal.

The location of the crack and its appearance leads to the conclusion that it was a part of the crack observed before the axle was cut into specimens, and notwithstanding its presence rupture of the specimen occurred  $2\frac{1}{2}$  inches from that place.

## SPECIMENS FROM AXLE NO. 7.

No. 4170.

Marks, <sup>M B 7</sup><sub>a</sub>

Diameter, 1".129.

Sectional area, 1. square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0010	.....	
10,000	10,000	.0025	0.	
15,000	15,000	.0039	0.	
18,000	18,000	.0050	.....	
19,000	19,000	.0056	.....	Elastic limit.
20,000	20,000	.0125	.0070	
21,000	21,000	.0170	.....	
22,000	22,000	.0267	.....	
23,000	23,000	.0345	.....	
24,000	24,000	.0470	.....	
25,000	25,000	.0605	.....	
26,000	26,000	.0800	.....	
27,000	27,000	.0990	.....	
28,000	28,000	.1230	.....	
29,000	29,000	.1435	.....	
30,000	30,000	.17	.....	
31,000	31,000	.20	.....	
32,000	32,000	.22	.....	
33,000	33,000	.27	.....	
34,000	34,000	.29	.....	
35,000	35,000	.31	.....	
36,000	36,000	.35	.....	
37,000	37,000	.40	.....	
38,000	38,000	.44	.....	
39,000	39,000	.49	.....	
40,000	40,000	.57	.....	
41,000	41,000	.62	.....	
42,000	42,000	.70	.....	
43,000	43,000	.82	.....	
44,000	44,000	.98	.....	
45,000	45,000	1.22	.....	Tensile strength.
45,790	45,790	1.68	.....	At time of fracture.
40,200	.....	.....	.....	= 28.5 per cent.
0	0	2.28	.....	

Elongation of inch sections, ".20, ".24, ".26, ".40, ".58\*, ".23, ".19, ".18.

Fractured ".25 from middle of stem, or 7½" from the end of the axle.

Appearance, fibrous.

Diameter at fracture, ".86. Area, .581 square inch.

Contraction of area, 41.9 per cent.

No. 4171.

Marks,  $\text{MB}_a$ 

Diameter, 1".129.

Sectional area, 1. square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inches.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0010	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0010	0.	
16,000	16,000	.0042	.....	
17,000	17,000	.0045	.....	Elastic limit.
18,000	18,000	.0049	.....	
19,000	19,000	.0053	.....	
20,000	20,000	.0072	.....	
21,000	21,000	.0195	.....	
22,000	22,000	.0285	.....	
23,000	23,000	.0413	.....	
24,000	24,000	.0555	.....	
25,000	25,000	.0670	.....	
26,000	26,000	.0870	.....	
27,000	27,000	.1075	.....	
28,000	28,000	.1290	.....	
29,000	29,000	.1523	.....	
30,000	30,000	.1750	.....	
31,000	31,000	.20	.....	Tensile strength. At time of rupture. =23.7 per cent.
32,000	32,000	.22	.....	
33,000	33,000	.26	.....	
34,000	34,000	.29	.....	
35,000	35,000	.32	.....	
36,000	36,000	.36	.....	
37,000	37,000	.40	.....	
38,000	38,000	.45	.....	
39,000	39,000	.50	.....	
40,000	40,000	.58	.....	
41,000	41,000	.65	.....	
42,000	42,000	.76	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.08	.....	
44,860	44,860	1.50	.....	
39,900	.....	.....	.....	
0	0	1.90	.....	

Elongation of inch sections, ".16 ".17 ".17 ".23 ".44\* ".41\* ".19 ".13

Fractured 3".75 from neck, or 8½" from end of axle. Appearance, fibrous.

Diameter at fracture, ".85. Area, .567 square inch.

Contraction of area, 43.3 per cent.

No. 4172.

Marks,  $M_B$ ,  
 $a$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0010	.....	
10,000	10,000	.0025	.0001	
15,000	15,000	.0040	.0001	
16,000	16,000	.0044	.....	
17,000	17,000	.0047	.....	Elastic limit.
18,000	18,000	.0053	.....	
19,000	19,000	.0065	.....	
20,000	20,000	.0122	.....	
21,000	21,000	.0173	.....	
22,000	22,000	.0240	.....	
23,000	23,000	.0328	.....	
24,000	24,000	.0428	.....	
25,000	25,000	.0536	.....	
26,000	26,000	.0725	.....	
27,000	27,000	.0850	.....	
28,000	28,000	.1015	.....	
29,000	29,000	.1190	.....	
30,000	30,000	.1370	.....	
31,000	31,000	.1605	.....	
32,000	32,000	.19	.....	
33,000	33,000	.22	.....	
34,000	34,000	.26	.....	
35,000	35,000	.29	.....	
36,000	36,000	.32	.....	
37,000	37,000	.37	.....	
38,000	38,000	.41	.....	
39,000	39,000	.47	.....	
40,000	40,000	.52	.....	
41,000	41,000	.59	.....	
42,000	42,000	.69	.....	
43,000	43,000	.80	.....	
44,000	44,000	.97	.....	
45,000	45,000	1.27	.....	Tensile strength.
0	0	1.74	.....	=71.7 per cent.

Elongation of inch sections, ".15, ".25, ".60\*, ".28, ".14, ".12, ".10, ".10.

Fractured 3".4 from the neck or 8½" from the end of the axle. Appearance, fibrous.

Diameter at fracture, ".84. Area, .554 square inch.

Contraction of area, 44.6 per cent.

No. 4173.

Marks,  $M B_b$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	.....	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	0.	
20,000	20,000	.0067	0.	
21,000	21,000	.0071	.....	
22,000	22,000	.0076	.....	
23,000	23,000	.0081	.....	Elastic limit.
24,000	24,000	.0092	.....	
25,000	25,000	.0258	.....	
26,000	26,000	.0348	.....	
27,000	27,000	.0535	.....	
28,000	28,000	.0832	.....	
29,000	29,000	.0930	.....	
30,000	30,000	.1300	.....	
31,000	31,000	.1525	.....	
32,000	32,000	.19	.....	
33,000	33,000	.24	.....	
34,000	34,000	.28	.....	
35,000	35,000	.32	.....	
36,000	36,000	.38	.....	
37,000	37,000	.43	.....	
38,000	38,000	.49	.....	
39,000	39,000	.54	.....	
40,000	40,000	.63	.....	
41,000	41,000	.73	.....	
42,000	42,000	.86	.....	
43,000	43,000	1.00	.....	
44,000	44,000	1.22	.....	
45,000	45,000	1.53	.....	
45,420	45,420	2.10	.....	Tensile strength.
40,200	.....	.....	.....	At time of rupture.
0	0	2.46	.....	= 24.8 per cent.

Elongation of inch sections, ".17, ".17, ".16, ".17, ".20, ".29, ".59\*, ".26, ".22, ".23.

Fractured 6" from the neck. Appearance, fibrous, lamellar.

Diameter at fracture, ".83. Area, .541 square inch.

Contraction of area, 45.9 per cent.

No. 4174.

Marks,  $M_B$ ,

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inches.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014		
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0067	0.	
21,000	21,000	.0071		Elastic limit.
22,000	22,000	.0076		
23,000	23,000	.0081		
24,000	24,000	.0091		
25,000	25,000	.0171	.0083	
26,000	26,000	.0380		
27,000	27,000	.0635		
28,000	28,000	.0865		
29,000	29,000	.1115		
30,000	30,000	.1395		
31,000	31,000	.17		
32,000	32,000	.20		
33,000	33,000	.24		
34,000	34,000	.28		
35,000	35,000	.32		
36,000	36,000	.37		
37,000	37,000	.42		
38,000	38,000	.49		
39,000	39,000	.55		
40,000	40,000	.62		
41,000	41,000	.72		
42,000	42,000	.83		
43,000	43,000	1.00		
44,000	44,000	1.19		
45,000	45,000	1.51		
45,640	45,640	2.08		Tensile strength. At time of rupture. =26.5 per cent.
38,600				
0	0	2.65		

Elongation of inch sections, ".18, ".18, ".20, ".20, ".23, ".33, ".60\*, ".28, ".24, ".21.

Fractured 6" from the neck. Appearance, fibrous.

Diameter at fracture, ".81; area, .515 square inch.

Contraction of area, 48.5 per cent.

No. 4175.

Marks,  $\frac{MB}{b}$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Persquare inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	.....	
10,000	10,000	.0031	0.	
15,000	15,000	.0049	0.	
20,000	20,000	.0066	0.	
21,000	21,000	.0070	.....	Elastic limit.
22,000	22,000	.0074	.....	
23,000	23,000	.0079	.....	
24,000	24,000	.0086	.....	
25,000	25,000	.0098	.0015	
26,000	26,000	.0260	.....	
27,000	27,000	.0452	.....	
28,000	28,000	.0770	.....	
29,000	29,000	.1025	.....	
30,000	30,000	.1240	.....	
31,000	31,000	.1560	.....	
32,000	32,000	.1825	.....	
33,000	33,000	.22	.....	
34,000	34,000	.26	.....	
35,000	35,000	.30	.....	
36,000	36,000	.35	.....	
37,000	37,000	.40	.....	
38,000	38,000	.45	.....	
39,000	39,000	.52	.....	
40,000	40,000	.58	.....	
41,000	41,000	.67	.....	
42,000	42,000	.78	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.08	.....	
45,000	45,000	1.31	.....	Tensile strength. At time of rupture. =27.3 per cent.
45,880	45,880	2.03	.....	
39,900	.....	2.73	.....	
0	0			

Elongation of inch sections, ".27, ".23, ".25, ".28, ".58\*, ".36, ".21, ".18, ".18, ".18.

Fractured at middle of stem. Appearance, fibrous, lamellar.

Diameter at fracture, ".82. Area, .528 square inch.

Contraction of area, 47.2 per cent.

No. 4176.

Marks, <sup>M B<sub>7</sub></sup><sub>c</sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	.....	
10,000	10,000	.0025	.....	
15,000	15,000	.0038	0.	
18,000	18,000	.0048	.....	
19,000	19,000	.0053	.....	Elastic limit.
20,000	20,000	.0085	.....	
21,000	21,000	.0161	.....	
22,000	22,000	.0246	.....	
23,000	23,000	.0341	.....	
24,000	24,000	.0468	.....	
25,000	25,000	.0618	.....	
26,000	26,000	.0815	.....	
27,000	27,000	.0983	.....	
28,000	28,000	.1213	.....	
29,000	29,000	.1408	.....	
30,000	30,000	.18	.....	
31,000	31,000	.20	.....	
32,000	32,000	.22	.....	
33,000	33,000	.26	.....	
34,000	34,000	.30	.....	
35,000	35,000	.32	.....	
36,000	36,000	.37	.....	
37,000	37,000	.40	.....	
38,000	38,000	.45	.....	
39,000	39,000	.50	.....	
40,000	40,000	.58	.....	
41,000	41,000	.68	.....	
42,000	42,000	.77	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.10	.....	
44,640	44,640	1.50	.....	Tensile strength. =22.4 per cent.
0	0	1.79	.....	

Elongation of inch sections, ".15, ".18, ".30, ".59, ".19, ".13, ".14, ".11.

Fractured 4".25 from the neck or 8½" from the end of the axle. Appearance, fibrous, seamy.

Diameter at fracture, ".86. Area, .581 square inch.

Contraction of area, 41.9 per cent.



## No. 4177.

Marks,  $M B_7$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0040	0.	
17,000	17,000	.0046	.....	
18,000	18,000	.0049	.....	Elastic limit.
19,000	19,000	.0052	.....	
20,000	20,000	.0057	.0004	
21,000	21,000	.0069	.....	
22,000	22,000	.0240	.....	
23,000	23,000	.0395	.....	
24,000	24,000	.0630	.....	
25,000	25,000	.0800	.....	
26,000	26,000	.0970	.....	
27,000	27,000	.1130	.....	
28,000	28,000	.1350	.....	
29,000	29,000	.1550	.....	
30,000	30,000	.18	.....	
31,000	31,000	.21	.....	
32,000	32,000	.23	.....	
33,000	33,000	.27	.....	
34,000	34,000	.31	.....	
35,000	35,000	.34	.....	
36,000	36,000	.38	.....	
37,000	37,000	.42	.....	
38,000	38,000	.48	.....	
39,000	39,000	.54	.....	
40,000	40,000	.62	.....	
41,000	41,000	.71	.....	
42,000	42,000	.82	.....	
43,000	43,000	.98	.....	
44,000	44,000	1.21	.....	
44,380	44,380	1.47	.....	
38,900	.....	.....	.....	Tensile strength. At time of rupture. = 22.5 per cent.
0	0	1.80	.....	

Elongation of inch sections, ".13, ".15, ".19, ".32, ".51\*, ".20, ".15, ".15.

Fractured at middle of stem, or  $7\frac{3}{4}$ " from the end of the axle. Appearance, fibrous.

Diameter at fracture, ".84. Area, .554 square inch.

Contraction of area, 44.6 per cent.

No. 4178.

Marks, <sup>M B,</sup><sub>c</sub>

Diameter, 1".129.

Sectional area, 1. square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inches.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0012	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0042	.0002	
16,000	16,000	.0046	.....	Elastic limit.
17,000	17,000	.0052	.....	
18,000	18,000	.0059	.....	
19,000	19,000	.0075	.....	
20,000	20,000	.0148	.0095	
21,000	21,000	.0261	.....	
22,000	22,000	.0340	.....	
30,000	30,000	.1920	.....	
31,000	31,000	.22	.....	
32,000	32,000	.25	.....	
33,000	33,000	.29	.....	
34,000	34,000	.32	.....	
35,000	35,000	.36	.....	
36,000	36,000	.40	.....	
37,000	37,000	.44	.....	
38,000	38,000	.50	.....	
39,000	39,000	.57	.....	
40,000	40,000	.63	.....	
41,000	41,000	.71	.....	
42,000	42,000	.82	.....	
43,000	43,000	.97	.....	
44,000	44,000	1.22	.....	
44,060	44,060	1.37	.....	Tensile strength.
32,200	.....	.....	.....	At time of rupture.
0	0	1.73	.....	=21.6 per cent.

Elongation of inch sections, ".13 ".16 ".19 ".27 ".57\* ".17 ".13 ".11.

Fractured 4" from the neck, or 6".75 from the end of the axle.

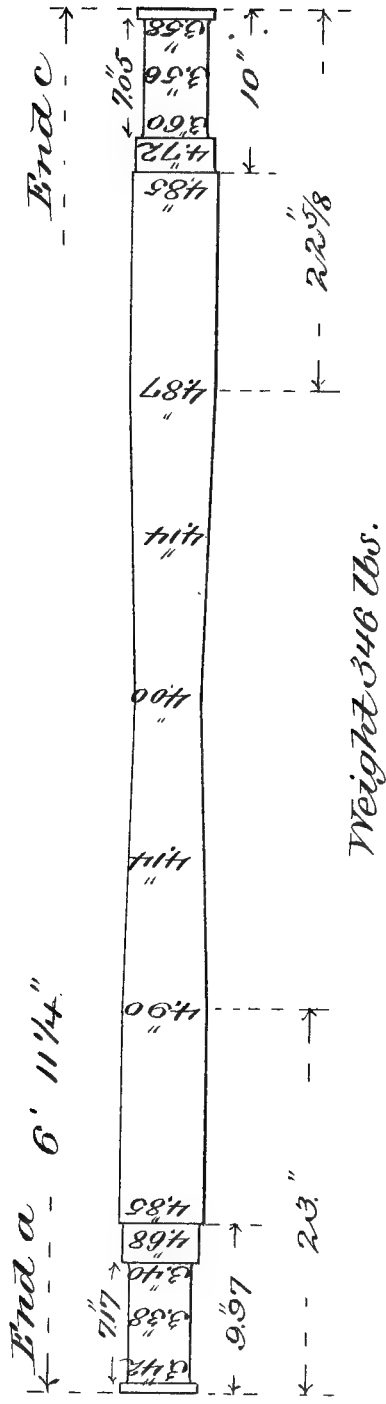
Appearance, fibrous, seamy.

Diameter at fracture, ".87. Area, .594 square inch.

Contraction of area, 40.6 per cent.

*Muck bar axle*

*No. 8.*



*Specimens.*



H Ex 165 51 2





## SPECIMENS FROM AXLE NO. 8.

No. 4179.

Marks, M B<sub>s</sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0010		
10,000	10,000	.0025	0.	
15,000	15,000	.0039	0.	
16,000	16,000	.0041		
17,000	17,000	.0044		
18,000	18,000	.0047		Elastic limit.
19,000	19,000	.0057		
20,000	20,000	.0081		
21,000	21,000	.0114		
22,000	22,000	.0168		
23,000	23,000	.0255		
24,000	24,000	.0420		
25,000	25,000	.0555		
26,000	26,000	.0741		
27,000	27,000	.0940		
28,000	28,000	.1157		
29,000	29,000	.1395		
30,000	30,000	.1585		
31,000	31,000	.19		
32,000	32,000	.22		
33,000	33,000	.25		
34,000	34,000	.28		
35,000	35,000	.31		
36,000	36,000	.35		
37,000	37,000	.40		
38,000	38,000	.44		
39,000	39,000	.50		
40,000	40,000	.57		
41,000	41,000	.64		
42,000	42,000	.74		
43,000	43,000	.84		
44,000	44,000	1.03		
45,000	45,000	1.50		Tensile strength.
0	0	1.71		= 21.4 per cent.

Elongation of inch sections: ".12, ".15, ".16, ".19, ".25, ".23, ".43\*, ".18.

Fractured 2".5 from neck, or 9½" from the end of axle. Appearance fibrous, lamellar. Numerous cracks developed during the test in the surface of the stem, beginning at a point 7" from the end of the axle and extending along 4" to the neck of the specimen, which was 11½" from the end of the axle. The cracks were principally confined to that half of the cylindrical surface which laid nearest the surface of the journal of the axle.

Diameter at fracture, ".95; area, .709 square inch.

Contraction of area, 29.1 per cent.

H. Ex. 165—49

No. 4180.

Marks,  $M B_s$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0010	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0040	0.	
16,000	16,000	.0043	.....	
17,000	17,000	.0047	.....	Elastic limit.
18,000	18,000	.0050	.....	
19,000	19,000	.0054	.....	
20,000	20,000	.0080	.....	
21,000	21,000	.0128	.....	
22,000	22,000	.0215	.....	
23,000	23,000	.0355	.....	
24,000	24,000	.0450	.....	
25,000	25,000	.0590	.....	
26,000	26,000	.0740	.....	
27,000	27,000	.0900	.....	
28,000	28,000	.1085	.....	
29,000	29,000	.1295	.....	
30,000	30,000	.1540	.....	
31,000	31,000	.1768	.....	
32,000	32,000	.20	.....	
33,000	33,000	.23	.....	
34,000	34,000	.27	.....	
35,000	35,000	.30	.....	
36,000	36,000	.35	.....	
37,000	37,000	.38	.....	
38,000	38,000	.43	.....	
39,000	39,000	.49	.....	
40,000	40,000	.56	.....	
41,000	41,000	.63	.....	
42,000	42,000	.74	.....	
43,000	43,000	.87	.....	
44,000	44,000	1.00	.....	Tensile strength. =19.6 per cent.
44,720	44,720	1.33	.....	
0	.....	1.57	.....	

Elongation of inch sections: ".10, ".11, ".12, ".15, ".19, ".21, ".37\*, ".32\*.

Fractured 1".30 from the neck, or 10½" from the end of the axle.  
Appearance, fibrous, seamy.

Diameter at fracture, ".91. Area, .650 square inch.

Contraction of area, 35. per cent.

No. 4181.

Marks, <sup>MB</sup><sub>a</sub>

Diameter, 1".035.

Sectional area, .841 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
541	1,000	0.	0.	Initial load.
4,205	5,000	.0011	0.	
8,410	10,000	.0024	0.	
12,615	15,000	.0038	0.	
13,456	16,000	.0040	-----	
14,297	17,000	.0042	-----	
15,138	18,000	.0045	-----	
15,979	19,000	.0049	-----	
16,820	20,000	.0053	.0061	Elastic limit.
17,661	21,000	.0076	-----	
18,502	22,000	.0135	-----	
19,343	23,000	.0210	-----	
20,184	24,000	.0315	-----	
21,025	25,000	.0445	-----	
21,866	26,000	.0592	-----	
22,707	27,000	.0703	-----	
23,548	28,000	.0834	-----	
24,389	29,000	.1028	-----	
25,230	30,000	.1220	-----	
26,071	31,000	.1400	-----	
26,912	32,000	.1665	-----	
27,753	33,000	.19	-----	
28,594	34,000	.22	-----	
29,435	35,000	.25	-----	
30,276	36,000	.30	-----	
31,117	37,000	.34	-----	
31,958	38,000	.38	-----	
32,799	39,000	.42	-----	
33,640	40,000	.48	-----	
34,481	41,000	.56	-----	
35,322	42,000	.63	-----	
36,163	43,000	.75	-----	
36,900	43,880	-----	-----	Tensile strength.
0	0	1.04	-----	=13 per cent.

Elongation of inch sections: ".13, ".35\*, ".13, ".12, ".10, ".09, ".07, ".05.

Fractured 2" from the neck, or  $9\frac{3}{4}$ " from the end of the axle. Appearance, fibrous, lamellar.

Numerous cracks were developed in the cylindrical surface of the stem, at a distance of 7" to 10" from the end of the axle.

Diameter at fracture ".87. Area, ".594.

Contraction of area, 29.4 per cent.

No. 4182.

Marks, <sup>M B</sup><sub>b</sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	-----	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0069	.0001	
21,000	21,000	.0073	-----	Elastic limit.
22,000	22,000	.0078	-----	
23,000	23,000	.0082	-----	
24,000	24,000	.0090	-----	
25,000	25,000	.0108	.0023	
26,000	26,000	.0190	-----	Rested under initial load 1 hour.
27,000	27,000	.0305	-----	
28,000	28,000	.0480	-----	
29,000	29,000	.0650	-----	
30,000	30,000	.0950	-----	
31,000	31,000	.1395	-----	
32,000	32,000	.17	-----	
33,000	33,000	.20	-----	
34,000	34,000	.24	-----	
35,000	35,000	.28	-----	
36,000	36,000	.32	-----	
37,000	37,000	.35	-----	
38,000	38,000	.41	-----	
39,000	39,000	.49	-----	
40,000	40,000	.54	-----	
41,000	41,000	.62	-----	
42,000	42,000	.74	-----	
43,000	43,000	.86	-----	
44,000	44,000	1.00	-----	
45,000	45,000	1.22	-----	
46,000	46,000	1.58	-----	Tensile strength. At time of rupture. =25 per cent.
46,460	46,460	2.00	-----	
39,800	-----	-----	-----	
II	0	2.50	-----	

Elongation of inch sections, ".17, ".18, ".22, ".53\*, ".41, ".23, ".23, ".20, ".17, ".16.

Fractured 6" from the neck. Appearance, fibrous.

Diameter at fracture, ".82. Area, .528 square inch.

Contraction of area, 47.2 per cent.



No. 4183.

Marks,  $M B_b$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	.....	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0068	0.	
21,000	21,000	.0072	.....	Elastic limit.
22,000	22,000	.0077	.....	
23,000	23,000	.0082	.....	
24,000	24,000	.0092	.....	
25,000	25,000	.0130	.0044	
26,000	26,000	.0248	.....	
27,000	27,000	.0428	.....	
28,000	28,000	.0570	.....	
29,000	29,000	.0770	.....	
30,000	30,000	.1125	.....	
31,000	31,000	.1495	.....	
32,000	32,000	.20	.....	
33,000	33,000	.22	.....	
34,000	34,000	.26	.....	
35,000	35,000	.29	.....	
36,000	36,000	.34	.....	
37,000	37,000	.39	.....	
38,000	38,000	.45	.....	
39,000	39,000	.52	.....	
40,000	40,000	.58	.....	
41,000	41,000	.68	.....	
42,000	42,000	.78	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.09	.....	
45,000	45,000	1.34	.....	
46,000	46,000	1.85	.....	Tensile strength. = 23.6 per cent.
0	0	2.36	.....	

Elongation of inch sections: ".16, ".19, ".26, ".60\*, ".28, ".30, ".18, ".16, ".16, ".17.

Fractured 5".5 from the neck. Appearance, fibrous.

Diameter at fracture, ".83. Area, .541 square inch.

Contraction of area, 45.9 per cent.

No. 4184.

Marks,  $M B_s$ 

Diameter, 1".129.

Sectional area, 1. square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total	Per square inch.	Elongation.	Set.	
Pounds.	Pounds.	Inches.	Inch.	
1,000	1,000	0.	0.	Initial load,
5,000	5,000	.0012	.....	
10,000	10,000	.0031	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0071	.0002	
21,000	21,000	.0077	.....	
22,000	22,000	.0081	.....	Elastic limit.
23,000	23,000	.0091	.....	
24,000	24,000	.0106	.....	
25,000	25,000	.0158	.0070	
26,000	26,000	.0259	.....	
27,000	27,000	.0375	.....	
28,000	28,000	.0730	.....	
29,000	29,000	.0992	.....	
30,000	30,000	.1248	.....	
31,000	31,000	.1560	.....	
32,000	32,000	.1880	.....	
33,000	33,000	.22	.....	
34,000	34,000	.27	.....	
35,000	35,000	.31	.....	
36,000	36,000	.36	.....	
37,000	37,000	.42	.....	
38,000	38,000	.47	.....	
39,000	39,000	.56	.....	
40,000	40,000	.63	.....	
41,000	41,000	.73	.....	
42,000	42,000	.85	.....	
43,000	43,000	1.02	.....	
44,000	44,000	1.22	.....	
45,000	45,000	1.63	.....	
45,510	45,510	2.20	.....	Tensile strength.
39,700	.....	.....	.....	At time of rupture.
0	0	2.50	.....	=25. per cent.

Elongation of inch sections : ".22, ".25, ".45\*, ".48\*, ".23, ".18, ".21, ".17, ".18, ".13.

Fractured 5" from the neck. Appearance, fibrous, seamy.

Diameter at fracture, ".83. Area, .541 square inch.

Contraction of area, 45.9 per cent.

No. 4185.

Marks,  $M B_c$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	.....	
10,000	10,000	.0026	0.	
15,000	15,000	.0040	0.	
16,000	16,000	.0043	.....	
17,000	17,000	.0046	.....	Elastic limit.
18,000	18,000	.0049	.....	
19,000	19,000	.0053	.....	
20,000	20,000	.0066	.....	
21,000	21,000	.0131	.....	
22,000	22,000	.0210	.....	
23,000	23,000	.0370	.....	
24,000	24,000	.0547	.....	
25,000	25,000	.0651	.....	
26,000	26,000	.0830	.....	
27,000	27,000	.1053	.....	
28,000	28,000	.1230	.....	
29,000	29,000	.1458	.....	
30,000	30,000	.17	.....	
31,000	31,000	.20	.....	
32,000	32,000	.22	.....	
33,000	33,000	.25	.....	
34,000	34,000	.29	.....	
35,000	35,000	.32	.....	
36,000	36,000	.36	.....	
37,000	37,000	.40	.....	
38,000	38,000	.46	.....	
39,000	39,000	.51	.....	
40,000	40,000	.57	.....	
41,000	41,000	.66	.....	
42,000	42,000	.75	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.07	.....	Tensile strength. =22.9 per cent.
44,870	44,870	1.50	.....	
0	0	1.83	.....	

Elongation of inch sections: ".19, ".49\*, ".31, ".28, ".20, ".13, ".13, ".10.

Fractured 2".25 from the neck, or  $9\frac{3}{4}$ " from the end of the axle. Appearance, fibrous, seamy.

Diameter at fracture, ".91; area, .650 square inch.

Contraction of area, 35 per cent.

No. 4186.

Marks,  $M B_c$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	.....	
10,000	10,000	.0027	.0001	
15,000	15,000	.0041	.0001	
16,000	16,000	.0043	.....	
17,000	17,000	.0046	.....	Elastic limit.
18,000	18,000	.0051	.....	
19,000	19,000	.0058	.....	
20,000	20,000	.0084	.....	
21,000	21,000	.0156	.....	
22,000	22,000	.0238	.....	
23,000	23,000	.0320	.....	
24,000	24,000	.0470	.....	
25,000	25,000	.0595	.....	
26,000	26,000	.0749	.....	
27,000	27,000	.0900	.....	
28,000	28,000	.1075	.....	
29,000	29,000	.1270	.....	
30,000	30,000	.1510	.....	
31,000	31,000	.17	.....	
32,000	32,000	.19	.....	
33,000	33,000	.22	.....	
34,000	34,000	.26	.....	
35,000	35,000	.30	.....	
36,000	36,000	.34	.....	
37,000	37,000	.39	.....	
38,000	38,000	.43	.....	
39,000	39,000	.49	.....	
40,000	40,000	.56	.....	
41,000	41,000	.63	.....	
42,000	42,000	.73	.....	
43,000	43,000	.87	.....	
44,000	44,000	1.07	.....	
44,500	44,500	1.35	.....	Tensile strength.
0	0	1.50	.....	=18.8 per cent.

Elongation of inch sections: ".08, ".10, ".11, ".16, ".21, ".25, ".39\*, ".20.

Fractured 2".25 from the neck, or 10" from the end of the axle. Appearance, fibrous, seamy.

Diameter at fracture, ".95. Area, .709 square inch.

Contraction of area, 29.1 per cent.

At a distance of 7½" from the end of the axle a small transverse crack opened, this crack being on the side of the specimen next the journal bearing. The dimensions of the crack were 2" long, and opened about ".00½ in width, its depth about ".02.

The sides of the crack were dark-colored and comparatively smooth. This crack is thought to be part of the crack discovered in this journal before cutting up the axle for test specimens.

This fractured tensile specimen was bent cold 33 degrees with the above mentioned crack at the middle of the bend on the tension side, which opened the crack in width and also developed numerous cracks in this vicinity, the principal injury occurring ".50 away from the dark-colored crack.

All other cracks developed had irregular surfaces, and exposed bright-colored metal.

No. 4187.

Marks,  $M_{cB_s}$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0040	0.	
16,000	16,000	.0043	.....	
17,000	17,000	.0046	.....	Elastic limit.
18,000	18,000	.0050	.....	
19,000	19,000	.0055	.....	
20,000	20,000	.0064	.....	
21,000	21,000	.0120	.....	
22,000	22,000	.0212	.....	
23,000	23,000	.0361	.....	
24,000	24,000	.0465	.....	
25,000	25,000	.0551	.....	
26,000	26,000	.0725	.....	
27,000	27,000	.0862	.....	
28,000	28,000	.1030	.....	
29,000	29,000	.1240	.....	
30,000	30,000	.1560	.....	
31,000	31,000	.19	.....	Tensile strength. = 21.3 per cent.
32,000	32,000	.22	.....	
33,000	33,000	.25	.....	
34,000	34,000	.28	.....	
35,000	35,000	.31	.....	
36,000	36,000	.34	.....	
37,000	37,000	.38	.....	
38,000	38,000	.42	.....	
39,000	39,000	.48	.....	
40,000	40,000	.52	.....	
41,000	41,000	.60	.....	
42,000	42,000	.69	.....	
43,000	43,000	.80	.....	
44,000	44,000	.97	.....	
45,000	45,000	1.20	.....	
45,070	45,070	1.41	.....	
0	0	1.70	.....	

Elongation of inch sections: ".09, ".11, ".13, ".19, ".26, ".48\*, ".26, ".18.

Fractured 4" from the neck, or  $8\frac{3}{4}$ " from the end of the axle. Appearance, fibrous, lamellar.

Diameter at fracture, ".91. Area, .650 square inch. Contraction of area, 35 per cent.

## SPECIMENS FROM AXLE NO. 9.

No. 4200.

Marks,  $M B_a$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0026	.0002	
15,000	15,000	.0046	.0007	Elastic limit, approximate.
16,000	16,000	.0051	.....	
17,000	17,000	.0058	.0016	
18,000	18,000	.0069	.....	
19,000	19,000	.0078	.....	
20,000	20,000	.0092	.0041	
21,000	21,000	.0138	.....	
22,000	22,000	.0211	.....	
23,000	23,000	.0293	.....	
24,000	24,000	.0385	.....	
25,000	25,000	.0550	.....	
26,000	26,000	.0695	.....	
27,000	27,000	.0875	.....	
28,000	28,000	.1000	.....	
29,000	29,000	.1225	.....	
30,000	30,000	.1450	.....	
31,000	31,000	.17	.....	
32,000	32,000	.20	.....	
33,000	33,000	.23	.....	
34,000	34,000	.26	.....	
35,000	35,000	.29	.....	
36,000	36,000	.33	.....	
37,000	37,000	.38	.....	
38,000	38,000	.42	.....	
39,000	39,000	.48	.....	
40,000	40,000	.53	.....	
41,000	41,000	.61	.....	
42,000	42,000	.70	.....	
43,000	43,000	.81	.....	
44,000	44,000	.98	.....	
45,000	45,000	1.81	.....	Tensile strength.
"	0	1.60	.....	= 20 per cent.

Elongation of inch sections: ".11, ".12, ".14, ".15, ".44\* ".31 ".20, ".13.

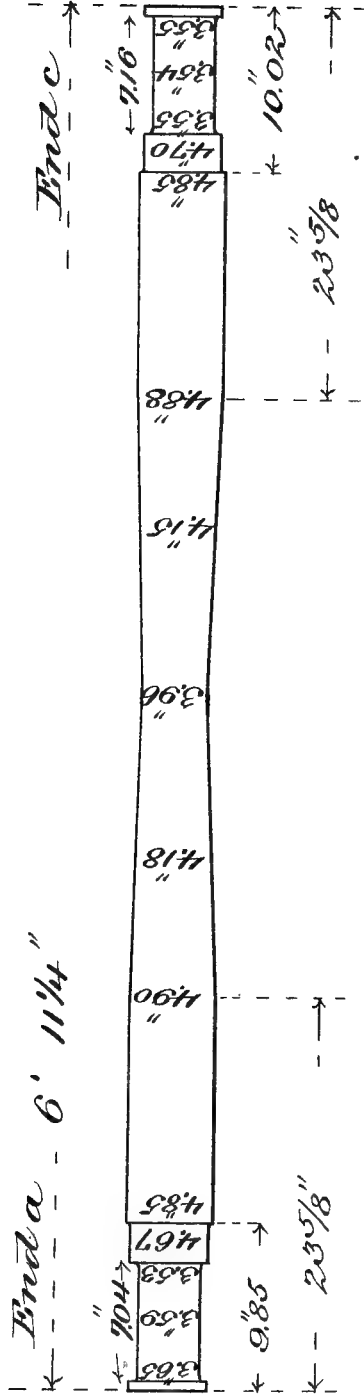
Fractured 4" from the neck, or 8".4 from the end of the axle.  
Appearance, fibrous, lamellar.

Diameter at fracture, ".91. Area, .650 square inch.

Contraction of area, 35 per cent.

*Muck bar axle*

*No. 9.*



*Specimens*



HEx 165 51 2







No. 4201.

Marks, M B<sub>9</sub>  
a

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0040	0.	
16,000	16,000	.0045	.....	
17,000	17,000	.0050	.....	Elastic limit.
18,000	18,000	.0055	.....	
19,000	19,000	.0063	.....	
20,000	20,000	.0077	.....	
21,000	21,000	.0090	.....	
22,000	22,000	.0155	.....	
23,000	23,000	.0225	.....	
24,000	24,000	.0332	.....	
25,000	25,000	.0460	.....	
26,000	26,000	.0578	.....	
27,000	27,000	.0698	.....	
28,000	28,000	.0857	.....	
29,000	29,000	.0947	.....	
30,000	30,000	.1242	.....	
31,000	31,000	.1450	.....	
32,000	32,000	.1715	.....	
33,000	33,000	.20	.....	
34,000	34,000	.22	.....	
35,000	35,000	.26	.....	
36,000	36,000	.30	.....	
37,000	37,000	.33	.....	
38,000	38,000	.38	.....	
39,000	39,000	.42	.....	
40,000	40,000	.49	.....	
41,000	41,000	.57	.....	
42,000	42,000	.67	.....	
43,000	43,000	.80	.....	Tensile strength. =14.3 per cent.
44,000	44,000	1.00	.....	
0	0	1.14	.....	

Elongation of inch sections, ".09, ".07, ".08, ".10, ".17, ".22, ".25\*, ".26.

Fractured 1".6 from the neck, or 9 $\frac{3}{4}$ " from the end of the axle.

Appearance, fibrous and dull spongy 60 per cent., granular 40 per cent.

Diameter at fracture, 1". Area, .785 square inch.

Contraction of area, 21.5 per cent.

Numerous cracks were developed in the cylindrical surface of the stem at a distance of 7 $\frac{1}{2}$ " to 10 $\frac{1}{2}$ " from the end of the axle.

No. 4202.

Marks,  $M B_a$ 

Diameter 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0010	0.	
10,000	10,000	.0025	0.	
15,000	15,000	.0040	.0001	
16,000	16,000	.0045	.....	Elastic limit.
17,000	17,000	.0048	.....	
18,000	18,000	.0058	.....	
19,000	19,000	.0072	.....	
20,000	20,000	.0087	.....	
21,000	21,000	.0120	.....	
22,000	22,000	.0190	.....	
23,000	23,000	.0280	.....	
24,000	24,000	.0420	.....	
25,000	25,000	.0538	.....	
26,000	26,000	.0685	.....	
27,000	27,000	.0820	.....	
28,000	28,000	.0965	.....	
29,000	29,000	.1130	.....	
30,000	30,000	.1379	.....	
31,000	31,000	.1635	.....	
32,000	32,000	.19	.....	
33,000	33,000	.22	.....	
34,000	34,000	.24	.....	
35,000	35,000	.28	.....	
36,000	36,000	.32	.....	
37,000	37,000	.36	.....	
38,000	38,000	.40	.....	
39,000	39,000	.46	.....	
40,000	40,000	.53	.....	
41,000	41,000	.60	.....	
42,000	42,000	.68	.....	
43,000	43,000	.79	.....	
44,000	44,000	.97	.....	
45,000	45,000	1.28	.....	Tensile strength.
II	0	1.54	.....	= 19.3 per cent.

Elongation of inch sections: ".15, ".19, ".31, ".38\*, ".15, ".13, ".11 12".

Fractured 4" from the neck, or  $8\frac{1}{2}$ " from the end of the axle. Appearance, fibrous .50 per cent., granular 50 per cent.

Diameter at fracture, ".92. Area, .665 square inch.

Contraction of area, 33.5 per cent.

Cracks developed in the cylindrical surface of the stem at a distance of 7" to  $10\frac{1}{2}$ " from the end of the axle.

No. 4203.

Marks,  $M B_b$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	.....	
10,000	10,000	.0032	.....	
15,000	15,000	.0050	0.	
20,000	20,000	.0070	.....	
21,000	21,000	.0073	.....	
22,090	22,000	.0078	.....	
23,000	23,000	.0081	.....	
24,000	24,000	.0092	.....	
25,000	25,000	.0104	.....	Elastic limit.
26,000	26,000	.0129	.....	
27,000	27,000	.0180	.....	
28,000	28,000	.0325	.....	
29,000	29,000	.0510	.....	
30,000	30,000	.0745	.....	
31,000	31,000	.1015	.....	
32,000	32,000	.1325	.....	
33,000	33,000	.18	.....	
34,000	34,000	.20	.....	
35,000	35,000	.24	.....	
36,000	36,000	.28	.....	
37,000	37,000	.33	.....	
38,000	38,000	.39	.....	
39,000	39,000	.44	.....	
40,000	40,000	.50	.....	
42,000	42,000	.64	.....	
44,000	44,000	.90	.....	
45,940	45,940	.....	.....	Tensile strength. =17.2 per cent.
0	0	1.72	.....	

Elongation of inch sections: ".53\*, ".21, ".16, ".14, ".13, ".13, ".11, ".09, ".10, ".12.

Diameter at fracture, ".80. Area, .503 square inch.

Contraction of area, 49.7 per cent.

Appearance of fracture, fibrous.

No. 4204.

Marks, M B.

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0017	.....	
10,000	10,000	.0036	.0002	
15,000	15,000	.0052	.0002	
20,000	20,000	.0070	.0002	
21,000	21,000	.0075	.....	
22,000	22,000	.0079	.....	
23,000	23,000	.0082	.....	
24,000	24,000	.0088	.....	
25,000	25,000	.0092	.0008	Elastic limit.
26,000	26,000	.0100	.....	
27,000	27,000	.0151	.....	
28,000	28,000	.0248	.....	
29,000	29,000	.0402	.....	
30,000	30,000	.0540	.....	
31,000	31,000	.0712	.....	
32,000	32,000	.0950	.....	
33,000	33,000	.1170	.....	
34,000	34,000	.1490	.....	
35,000	35,000	.1825	.....	
36,000	36,000	.22	.....	
37,000	37,000	.27	.....	
38,000	38,000	.31	.....	
39,000	39,000	.37	.....	
40,000	40,000	.42	.....	Tensile strength. =16.6 per cent.
41,000	41,000	.48	.....	
42,000	42,000	.54	.....	
43,000	43,000	.64	.....	
44,000	44,000	.78	.....	
45,000	45,000	.91	.....	
46,000	46,000	1.16	.....	
46,490	46,490	1.41	.....	
0	0	1.66	.....	

Elongation of inch sections: ".53\*, ".21, ".19, ".15, ".14, ".12, ".09, ".08, ".07, ".08.

Fractured 1".6 from neck. Appearance, fibrous.

Diameter at fracture, ".83. Area, .541 square inch.

Contraction of area, 45.9 per cent.

No. 4205.

Marks,  $M B_3$ 

Diameter, 1".129.

Sectional area, 1 square inch.

Length of stem, 12".

Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	.....	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0068	.0001	
21,000	21,000	.0072	.....	Elastic limit.
22,000	22,000	.0076	.....	
23,000	23,000	.0081	.....	
24,000	24,000	.0084	.....	
25,000	25,000	.0088	.0006	
26,000	26,000	.0097	.....	
27,000	27,000	.0120	.....	
28,000	28,000	.0198	.....	
29,000	29,000	.0340	.....	
30,000	30,000	.0575	.....	
31,000	31,000	.0780	.....	
32,000	32,000	.1025	.....	
33,000	33,000	.1380	.....	
34,000	34,000	.1720	.....	
35,000	35,000	.22	.....	
36,000	36,000	.26	.....	
37,000	37,000	.30	.....	
38,000	38,000	.34	.....	
39,000	39,000	.36	.....	
40,000	40,000	.47	.....	
41,000	41,000	.54	.....	
42,000	42,000	.62	.....	
43,000	43,000	.72	.....	
44,000	44,000	.88	.....	
45,000	45,000	1.03	.....	Tensile strength. At time of rupture. = 17.6 per cent.
46,260	46,260	1.57	.....	
48,300	.....	1.76	.....	

Elongation of inch sections: ".09, ".09, ".10, ".12, ".13, ".16, ".15, ".18  
".21, ".53\*.

Fractured 1".70 from the neck. Appearance, fibrous.

Diameter at fracture, ".83. Area, .541 square inch.

Contraction of area, 45.9 per cent.

No. 4206.

Marks, M B<sub>c</sub>

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	.....	
10,000	10,000	.0026	0.	
15,000	15,000	.0041	0.	
16,000	16,000	.0045	.....	
17,000	17,000	.0049	.....	Elastic limit.
18,000	18,000	.0055	.....	
19,000	19,000	.0065	.....	
20,000	20,000	.0084	.....	
21,000	21,000	.0110	.....	
22,000	22,000	.0172	.....	
23,000	23,000	.0285	.....	
24,000	24,000	.0412	.....	
25,000	25,000	.0515	.....	
26,000	26,000	.0651	.....	
27,000	27,000	.0780	.....	
28,000	28,000	.0965	.....	
29,000	29,000	.1185	.....	
30,000	30,000	.1360	.....	
31,000	31,000	.1625	.....	
32,000	32,000	.19	.....	
33,000	33,000	.22	.....	
34,000	34,000	.25	.....	
35,000	35,000	.28	.....	
36,000	36,000	.30	.....	
37,000	37,000	.34	.....	
38,000	38,000	.40	.....	
39,000	39,000	.44	.....	
40,000	40,000	.48	.....	
41,000	41,000	.54	.....	
42,000	42,000	.62	.....	
43,000	43,000	.70	.....	
44,000	44,000	.78	.....	
45,000	45,000	.98	.....	
46,000	46,000	1.21	.....	Tensile strength. = 23.8 per cent.
46,670	46,670	1.57	.....	
0	0	1.90	.....	

Elongation of inch sections: ".14, ".17, ".17, ".25, ".57\*, ".26, ".19, ".15.

Fractured near middle of stem, or  $7\frac{5}{8}$ " from the end of the axle.

Appearance, fibrous.

Diameter at fracture, ".83. Area, .541 square inch.

Contraction of area, 45.9 per cent.

No. 4207.

Marks,  $\frac{MB}{C}$ .

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0012	.....	
10,000	10,000	.0025	0.	
15,000	15,000	.0040	.0001	
16,000	16,000	.0042	.....	
17,000	17,000	.0044	.....	Elastic limit.
18,000	18,000	.0047	.....	
19,000	19,000	.0052	.....	
20,000	20,000	.0062	.....	
21,000	21,000	.0095	.....	
22,000	22,000	.0160	.....	
23,000	23,000	.0330	.....	
24,000	24,000	.0522	.....	
25,000	25,000	.0685	.....	
26,000	26,000	.0855	.....	
27,000	27,000	.1020	.....	
28,000	28,000	.1242	.....	
29,000	29,000	.1430	.....	
30,000	30,000	.1725	.....	
31,000	31,000	.20	.....	
32,000	32,000	.22	.....	
33,000	33,000	.25	.....	
34,000	34,000	.28	.....	
35,000	35,000	.31	.....	
36,000	36,000	.36	.....	
37,000	37,000	.40	.....	
38,000	38,000	.44	.....	
39,000	39,000	.49	.....	
40,000	40,000	.55	.....	
41,000	41,000	.61	.....	
42,000	42,000	.70	.....	
43,000	43,000	.80	.....	
44,000	44,000	.93	.....	
45,000	45,000	1.13	.....	Tensile strength. = 24.9 per cent.
45,810	45,810	1.56	.....	
0	0	1.99	.....	

Elongation of inch sections, ".15, ".22, ".27, ".65\*, ".24, ".17, ".15, ".14.

Fractured 4".25 from the neck, or 8" from the end of the axle.  
Appearance fibrous.

Diameter at fracture, ".80. Area, .503 square inch.

Contraction of area, 49.7 per cent.

H. Ex. 165—50

No. 4208.

Marks, M B,  
C

Diameter, 1".129.

Sectional area, 1 square inch.

Gauged length, 8".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0011	0.	
10,000	10,000	.0026	.0001	
15,000	15,000	.0041	.0001	
16,000	16,000	.0043	.....	Elastic limit.
17,000	17,000	.0046	.....	
18,000	18,000	.0052	.....	
19,000	19,000	.0062	.....	
20,000	20,000	.0086	.....	
21,000	21,000	.0122	.....	
22,000	22,000	.0160	.....	
23,000	23,000	.0308	.....	
24,000	24,000	.0440	.....	
25,000	25,000	.0564	.....	
26,000	26,000	.0665	.....	
27,000	27,000	.0835	.....	
28,000	28,000	.0990	.....	
29,000	29,000	.1192	.....	
30,000	30,000	.1380	.....	
31,000	31,000	.1640	.....	
32,000	32,000	.19	.....	
33,000	33,000	.22	.....	
34,000	34,000	.25	.....	
35,000	35,000	.28	.....	
36,000	36,000	.31	.....	
37,000	37,000	.35	.....	
38,000	38,000	.40	.....	
39,000	39,000	.45	.....	
40,000	40,000	.51	.....	
41,000	41,000	.59	.....	
42,000	42,000	.66	.....	
43,000	43,000	.77	.....	
44,000	44,000	.90	.....	
45,000	45,000	1.09	.....	
45,730	45,730	1.50	.....	Tensile strength. = 22.6 per cent.
0	0	1.81	.....	

Elongation of inch sections, ".12, ".14, ".14, ".28, ".52\*, ".23, ".21, ".17.

Fractured at middle of stem, or 7 $\frac{1}{2}$ " from the end of the axle. Appearance, fibrous.

Diameter at fracture, ".85. Area, .567 square inch.

Contraction of area, 43.3 per cent.



TABULATION OF SPECIMENS FROM MUCK-BAR TENDER AXLES NOS. 7, 8, AND 9.

No. of test.	Marks.	Diameter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Inches.	Sq. in.	Pounds.	Pounds.	Per ct.	" Sq. in.	Per ct.		" " " " " "
4170	M B <sub>7</sub> -a	1.129	1.00	19,000	45,780	28.5	Diam., .86=581	41.9	Fibrous.....	20, 24, 26, 40, 58*, 23, 19, 18
4171	do	1.129	1.00	19,000	44,860	28.7	Diam., .85=567	43.3	do.....	16, 17, 17, 23, 44*, 41, 19, 13
4172	do	1.129	1.00	17,000	45,000	21.7	Diam., .84=554	44.6	do.....	16, 25, 60*, 28, 14, 12, 10, 10
4173	M B <sub>7</sub> -b	1.129	1.00	23,000	45,420	24.6	Diam., .83=541	45.9	Fibrous lamellar.....	17, 17, 16, 17, 20, 29, 59*, 26, 22, 23
4174	do	1.129	1.00	23,000	45,640	26.5	Diam., .81=515	48.5	Fibrous.....	16, 18, 20, 20, 23, 33, 60*, 28, 24, 21
4175	do	1.129	1.00	23,000	45,880	27.3	Diam., .82=528	47.2	Fibrous lamellar.....	27, 23, 25, 28, 58*, 36, 21, 18, 18, 18
4176	M B <sub>7</sub> -c	1.129	1.00	19,000	44,640	22.4	Diam., .86=581	41.9	Fibrous seamy.....	15, 18, 30, 59*, 19, 13, 14, 11
4177	do	1.129	1.00	20,000	44,380	22.5	Diam., .84=554	44.6	Fibrous.....	13, 15, 19, 32, 51*, 20, 15, 15
4178	do	1.129	1.00	16,000	44,060	21.6	Diam., .87=594	40.6	Fibrous seamy.....	13, 16, 19, 27, 57*, 17, 13, 11
4179	M B <sub>8</sub> -a	1.129	1.00	18,000	45,000	21.4	Diam., .95=709	29.1	Fibrous lamellar.....	12, 15, 16, 19, 25, 23, 43*, 18
4180	do	1.129	1.00	13,000	44,720	13.6	Diam., .91=650	35.0	Fibrous seamy.....	10, 11, 12, 15, 19, 21, 37*, 33*
4181	do	1.129	1.00	20,000	45,880	13.0	Diam., .87=594	23.4	Fibrous lamellar.....	13, 35*, 13, 12, 10, .09, .07, .05
4182	M B <sub>8</sub> -b	1.129	1.00	23,000	46,460	25.0	Diam., .82=528	47.2	Fibrous.....	17, 18, 22, 53*, 41, 23, 23, 20, 17, 16
4183	do	1.129	1.00	23,000	46,040	23.6	Diam., .83=541	45.9	Fibrous seamy.....	16, 19, 26, 60*, 28, 30, 18, 16, 17
4184	do	1.129	1.00	22,000	45,510	25.0	Diam., .83=541	45.9	Fibrous seamy.....	22, 25, 46*, 48*, 28, 18, 21, 17, 18, 13
4185	M B <sub>8</sub> -c	1.129	1.00	19,000	44,870	22.9	Diam., .91=650	35.0	do.....	19, 49*, 31, 28, 20, 13, 13, 10
4186	do	1.129	1.00	17,000	44,500	18.8	Diam., .92=709	29.1	do.....	40, 10, 11, 16, 21, 23, 39*, 20
4187	do	1.129	1.00	19,000	45,070	21.3	Diam., .91=650	35.0	Fibrous lamellar.....	40, 11, 13, 19, 26, 48*, 26, 18
4200	M B <sub>9</sub> -a	1.129	1.00	15,000	45,000	20.0	Diam., .91=650	35.0	do.....	11, 12, 14, 15, 44*, 31, 20, 13
4201	do	1.129	1.00	18,000	44,000	14.3	Diam., 1.00=785	21.5	Fibrous and dull spongy, 60 per cent.; granular, 40 per cent.	40, .07, .08, 10, 17, 22, 25*, 26
4202	do	1.129	1.00	17,000	45,000	19.3	Diam., .92=665	33.5	Fibrous, 50 per cent.; granular, 50 per cent.	15, 19, 31, 38*, 15, 13, 11, 12
4203	M B <sub>9</sub> -b	1.129	1.00	23,000	45,940	17.2	Diam., .86=503	49.7	Fibrous.....	53*, 21, 16, 14, 13, 13, 11, .09, 10, 12
4204	do	1.129	1.00	25,000	46,480	16.6	Diam., .85=541	45.9	do.....	53*, 21, 19, 15, 14, 12, .09, .08, .07, .08
4205	do	1.129	1.00	25,000	46,260	17.6	Diam., .83=541	45.9	do.....	40, .09, 10, 12, 13, 16, 15, 18, 21, 53*
4206	M B <sub>9</sub> -c	1.129	1.00	18,000	46,670	23.8	Diam., .83=541	45.9	do.....	14, 17, 17, 25, 57*, 26, 19, 15
4207	do	1.129	1.00	19,000	45,810	24.9	Diam., .80=503	49.7	do.....	15, 22, 27, 65*, 24, 17, 15, 14
4208	do	1.129	1.00	17,000	45,730	22.6	Diam., .88=567	43.3	do.....	12, 14, 14, 28, 55*, 23, 21, 17



---

---

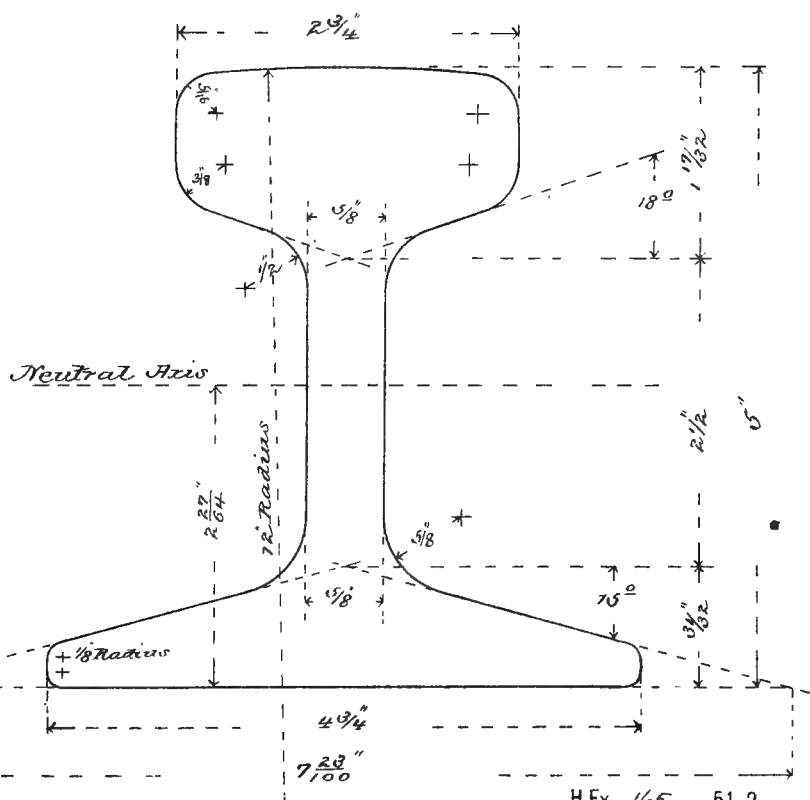
STEEL RAILS, TRANSVERSE TESTS,  
AND  
HARDNESS.

---

---



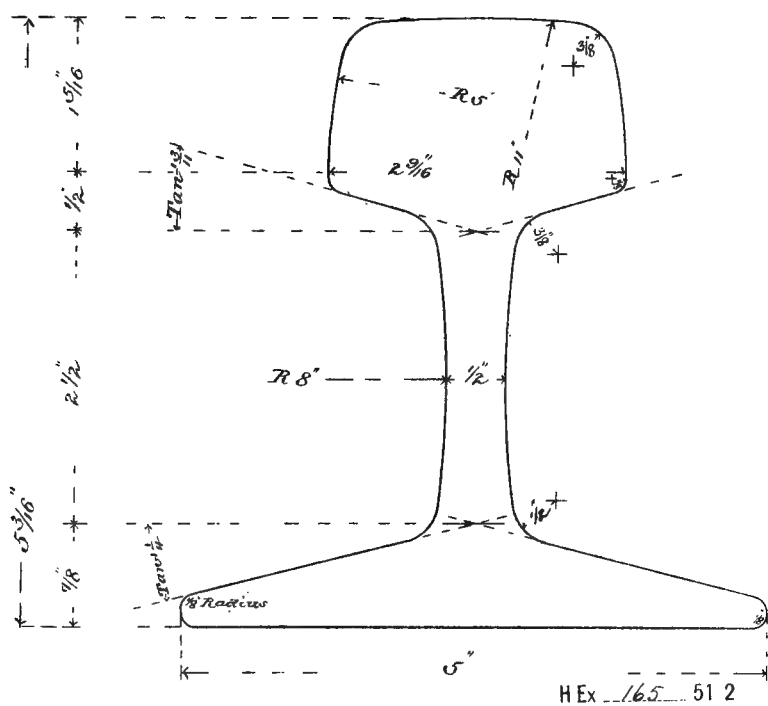
*Delano Section*



H Ex. 165 ..... 51 2



# McClure Section







Eight samples of steel rails were contributed for test by Mr. F. A. Delano, of the C. B. and Q. R. R., Chicago, Ill., of which four samples were known as the Delano section and four samples as the McClure section, each of 85 pounds weight per yard.

The drawings illustrate the form and dimensions of the templates from which these sections were rolled.

The actual weight and height of each is recorded with the details of the transverse tests.

The transverse tests were made with the rail supported on end bearings 30 inches apart, to obtain good bearing surfaces for which, seats were planed on the base of the rail. Loads were applied at the middle of the length, using a plunger having  $1\frac{1}{2}$  inches length of face.

Hardness determinations were made on the heads of the rails and also at different depths below the original surface. The metal was planed off different depths for the purpose of receiving the cut of the indenting tool used.

## STEEL RAIL.

No. 53.

Delano section.

Weight, 85½ pounds per yard.

Height, 5".02.

Marks, 5115.

Applied loads.	Deflection.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
4,000	.0032	.0032	.....	
6,000	.0058	.0026	.....	
8,000	.0078	.0020	.....	
10,000	.0099	.0021	.0013	
12,000	.0120	.0021	.....	
14,000	.0141	.0021	.....	
16,000	.0161	.0020	.....	
18,000	.0181	.0020	.....	
20,000	.0200	.0019	.0014	
22,000	.0220	.0020	.....	
24,000	.0240	.0020	.....	
26,000	.0259	.0019	.....	
28,000	.0278	.0019	.....	
30,000	.0297	.0019	.0016	
32,000	.0313	.0016	.....	
34,000	.0330	.0017	.....	
36,000	.0348	.0018	.....	
38,000	.0365	.0017	.....	
40,000	.0383	.0018	.0019	
42,000	.0400	.0017	.....	
44,000	.0419	.0019	.....	
46,000	.0438	.0019	.....	
48,000	.0455	.0017	.....	
50,000	.0473	.0018	.0020	
52,000	.0491	.0018	.....	
54,000	.0509	.0018	.....	
56,000	.0524	.0015	.....	
58,000	.0543	.0019	.....	
60,000	.0562	.0019	.0022	
62,000	.0582	.0020	.....	
64,000	.0600	.0018	.....	
66,000	.0618	.0018	.....	
68,000	.0636	.0018	.....	
70,000	.0655	.0019	.0030	
72,000	.0676	.0021	.....	
74,000	.0695	.0019	.....	
76,000	.0717	.0022	.....	
78,000	.0737	.0020	.....	
80,000	.0758	.0021	.0044	
82,000	.0782	.0024	.....	
84,000	.0804	.0022	.....	
86,000	.0829	.0025	.....	
88,000	.0852	.0023	.....	
90,000	.0880	.0028	.0076	
92,000	.0905	.0025	.....	
94,000	.0929	.0024	.....	
96,000	.0953	.0024	.....	
98,000	.0981	.0028	.....	
100,000	.1024	.0043	.0121	
102,000	.1048	.0024	.....	
104,000	.1080	.0032	.....	
106,000	.1105	.0025	.....	
108,000	.1134	.0029	.....	
110,000	.1180	.0046	.0199	
112,000	.1227	.0047	.....	Scale starts off in vicinity of middle bearing.
116,000	.1306	.0079	.....	
118,000	.1349	.0043	.....	
120,000	.1410	.0061	.0326	
122,000	.1500	.0090	.....	
124,000	.1562	.0062	.....	
126,000	.1665	.0103	.....	
128,000	.1824	.0159	.....	
130,000	.1973	.0149	.0782	Test discontinued.

## STEEL RAIL.

No. 54.

McClure section.

Weight, 84 $\frac{1}{2}$  pounds per yard.

Height, 5".17.

Mark, 5567.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
4,000	.0022	.0022	.....	
6,000	.0047	.0025	.....	
8,000	.0069	.0022	.....	
10,000	.0089	.0020	.0002	
12,000	.0110	.0021	.....	
14,000	.0130	.0020	.....	
16,000	.0149	.0019	.....	
18,000	.0187	.0018	.....	
20,000	.0186	.0019	.0004	
22,000	.0203	.0017	.....	
24,000	.0223	.0020	.....	
26,000	.0241	.0018	.....	
28,000	.0260	.0019	.....	
30,000	.0278	.0018	.0004	
32,000	.0294	.0016	.....	
34,000	.0310	.0016	.....	
36,000	.0329	.0019	.....	
38,000	.0347	.0018	.....	
40,000	.0366	.0019	.0006	
42,000	.0388	.0017	.....	
44,000	.0400	.0017	.....	
46,000	.0417	.0017	.....	
48,000	.0436	.0019	.....	
50,000	.0454	.0018	.0007	
52,000	.0471	.0017	.....	
54,000	.0490	.0019	.....	
56,000	.0508	.0018	.....	
58,000	.0525	.0017	.....	
60,000	.0543	.0018	.0010	
62,000	.0560	.0017	.....	
64,000	.0577	.0017	.....	
66,000	.0595	.0018	.....	
68,000	.0612	.0017	.....	
70,000	.0630	.0018	.0013	
72,000	.0651	.0021	.....	
74,000	.0670	.0019	.....	
76,000	.0690	.0020	.....	
78,000	.0708	.0018	.....	
80,000	.0726	.0018	.0021	
82,000	.0747	.0021	.....	
84,000	.0764	.0017	.....	
86,000	.0782	.0018	.....	
88,000	.0802	.0020	.....	
90,000	.0822	.0020	.0030	
92,000	.0847	.0025	.....	
94,000	.0865	.0018	.....	
96,000	.0876	.0011	.0030	
98,000	.0896	.0020	.....	
100,000	.0916	.0020	.0037	
102,000	.0939	.0023	.....	
104,000	.0961	.0022	.....	
106,000	.0982	.0021	.....	
108,000	.1010	.0028	.....	
110,000	.1039	.0029	.0068	
112,000	.1068	.0029	.....	Scale starts off in vicinity of middle bearing.
114,000	.1096	.0028	.....	
116,000	.1140	.0044	.....	
118,000	.1181	.0041	.....	
120,000	.1221	.0040	.0161	
122,000	.1300	.0079	.....	
124,000	.1363	.0063	.....	
126,000	.1453	.0090	.....	Test discontinued.
128,000	.1580	.0127	.....	
130,000	.1743	.0163	.0578	

## STEEL RAIL.

No. 55.

Delano section.

Weight,  $84\frac{3}{4}$  pounds per yard.Height, 5'' $\frac{1}{2}$ .

Mark, 5117.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
10,000	.0093	-----	.0003	
20,000	.0190	-----	.0003	
30,000	.0283	-----	.0005	
40,000	.0371	-----	.0006	
50,000	.0460	-----	.0008	
60,000	.0550	-----	.0008	
70,000	.0636	-----	.0009	
80,000	.0725	-----	.0012	
82,000	.0745	.0020	-----	
84,000	.0765	.0020	-----	
86,000	.0782	.0017	-----	
88,000	.0800	.0018	-----	
90,000	.0821	.0021	.0020	
92,000	.0840	.0019	-----	
94,000	.0860	.0020	-----	
96,000	.0880	.0020	-----	
98,000	.0900	.0020	-----	
100,000	.0922	.0022	.0035	Scale starts off.
102,000	.0944	.0022	-----	
104,000	.0964	.0020	-----	
106,000	.0987	.0023	-----	
108,000	.1009	.0022	-----	
110,000	.1033	.0024	.0052	
112,000	.1060	.0027	-----	
114,000	.1083	.0023	-----	
116,000	.1109	.0026	-----	
118,000	.1133	.0024	-----	
120,000	.1170	.0037	.0099	
122,000	.1202	.0032	-----	
124,000	.1230	.0028	-----	
126,000	.1260	.0030	-----	
128,000	.1302	.0042	-----	
130,000	.1358	.0056	.0190	
132,000	.1433	.0075	-----	Test discontinued.
134,000	.1502	.0069	-----	
136,000	.1620	.0118	-----	
138,000	.1750	.0180	-----	
140,000	.1895	.0145	.0618	

## STEEL RAIL.

No. 56.

McClure section.

Weight,  $84\frac{1}{2}$  pounds per yard.

Height, 5".18.

Mark, 5621.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	6.	Initial load.
10,000	.0091		.0003	
20,000	.0190			
30,000	.0283			
40,000	.0370		.0007	
50,000	.0462			
60,000	.0554			
70,000	.0660			
80,000	.0767		.0052	
82,000	.0793	.0028		
84,000	.0817	.0024		
86,000	.0843	.0026		
88,000	.0869	.0026		
90,000	.0900	.0031	.0099	
92,000	.0931	.0031		Scale starts off.
94,000	.0958	.0027		
96,000	.0988	.0030		
98,000	.1020	.0032		
100,000	.1054	.0034	.0162	
102,000	.1097	.0043		
104,000	.1130	.0033		
106,000	.1178	.0048		
108,000	.1223	.0045		
110,000	.1285	.0062	.0298	
112,000	.1355	.0070		Test discontinued.
114,000	.1430	.0076		
116,000	.1578	.0148		
118,000	.1726	.0148		
120,000	.1950	.0224	.0850	

## STEEL RAIL.

No. 57.

Delano section.

Weight, 81.72 pounds per yard.

Height, 4'' 99.

Mark, 5068.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
10,000	.0094	.....	.0002	
20,000	.0197	.....	.....	
30,000	.0290	.....	.....	
40,000	.0384	.....	.0006	
50,000	.0474	.....	.....	
60,000	.0568	.....	.....	
70,000	.0663	.....	.....	
80,000	.0760	.....	.0011	
90,000	.0870	.....	.0037	
92,000	.0894	.0024	.....	
94,000	.0918	.0024	.....	
96,000	.0944	.0026	.....	
98,000	.0972	.0028	.....	
100,000	.0995	.0023	.0067	
102,000	.1025	.0030	.....	Scale starts off.
104,000	.1051	.0026	.....	
106,000	.1085	.0034	.....	
108,000	.1120	.0035	.....	
110,000	.1168	.0048	.0140	
112,000	.1213	.0045	.....	
114,000	.1268	.0055	.....	
116,000	.1340	.0072	.....	
118,000	.1433	.0093	.....	
120,000	.1547	.0114	.0412	
122,000	.1680	.0133	.....	
124,000	.1821	.0141	.....	
126,000	.1992	.0171	.....	Test discontinued.
128,000	.2126	.0134	.....	
130,000	.2338	.0212	.1077	

## STEEL RAIL.

No. 58.

McClure section.

Weight,  $83\frac{1}{2}$  pounds per yard.

Height, 5" .18.

Mark, 5602.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
10,000	.0093	.....	.0004	
20,000	.0193	.....	.....	
30,000	.0289	.....	.....	
40,000	.0379	.....	.0008	
50,000	.0470	.....	.....	
60,000	.0560	.....	.....	
70,000	.0650	.....	.....	
80,000	.0735	.....	.0011	
90,000	.0833	.....	.0026	
92,000	.0851	.0028	.....	Scale starts off.
94,000	.0871	.0020	.....	
96,000	.0891	.0020	.....	
98,000	.0912	.0021	.....	
100,000	.0933	.0021	.0038	
102,000	.0957	.0024	.....	
104,000	.0979	.0022	.....	
106,000	.1002	.0023	.....	
108,000	.1024	.0022	.....	
110,000	.1050	.0026	.0002	
112,000	.1077	.0027	.....	
114,000	.1100	.0023	.....	
116,000	.1127	.0027	.....	
118,000	.1157	.0030	.....	
120,000	.1188	.0031	.0108	
122,000	.1222	.0035	.....	
124,000	.1259	.0036	.....	
126,000	.1323	.0064	.....	
128,000	.1428	.0105	.....	
130,000	.1540	.0112	.0360	
132,000	.1695	.0155	.....	After 5 minutes. After 10 minutes. Test discontinued.
134,000	.1942	.0247	.....	
136,000	.2050	.0108	.....	
138,000	.2125	.0075	.....	
140,000	.2360	.0235	.....	
.....	.2478	.0118	.....	
.....	.2520	.0042	.1205	
.....	.....	.....	.....	

## STEEL RAIL.

No. 59.

Delano section.  
 Weight, 81 pounds per yard.  
 Height, 5".  
 Marks, 5071.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
10,000	.0034	.....	.0004	
20,000	.0193	.....	.....	
30,000	.0288	.....	.....	
40,000	.0381	.....	.0007	
50,000	.0472	.....	.....	
60,000	.0563	.....	.....	
70,000	.0655	.....	.....	
80,000	.0751	.....	.0014	
90,000	.0850	.....	.0022	
92,000	.0873	.0023	.....	
94,000	.0892	.0019	.....	
96,000	.0912	.0020	.....	
98,000	.0940	.0028	.....	
100,000	.0960	.0020	.0040	
102,000	.0983	.0023	.....	
104,000	.1008	.0025	.....	
106,000	.1034	.0026	.....	Scale starts off.
108,000	.1060	.0026	.....	
110,000	.1089	.0029	.0074	
112,000	.1123	.0034	.....	
114,000	.1150	.0027	.....	
116,000	.1184	.0034	.....	
118,000	.1225	.0041	.....	
120,000	.1275	.0050	.0164	
122,000	.1370	.0095	.....	
124,000	.1460	.0090	.....	
126,000	.1607	.0147	.....	Test discontinued.
128,000	.1743	.0136	.....	
130,000	.1925	.0182	.0603	



## STEEL RAIL.

No. 60.

McClure section.

Weight, 82.08 pounds per yard.

Height, 5".18.

Marks, 5642.

Applied loads.	Deflections.	Successive deflections.	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,000	0.	0.	0.	Initial load.
10,000	.0093	.....	.0003	
20,000	.0190	.....		
30,000	.0282	.....		
40,000	.0373	.....	.0005	
50,000	.0464	.....		
60,000	.0549	.....		
70,000	.0642	.....		
80,000	.0737	.....	.0019	
90,000	.0833	.....	.0031	
92,000	.0858	.0025	.....	
94,000	.0880	.0022	.....	
96,000	.0900	.0020	.....	
98,000	.0921	.0021	.....	
100,000	.0946	.0025	.0051	
102,000	.0976	.0030	.....	
104,000	.0998	.0022	.....	
106,000	.1020	.0022	.....	
108,000	.1048	.0028	.....	
110,000	.1077	.0029	.0089	
112,000	.1109	.0032	.....	
114,000	.1138	.0029	.....	
116,000	.1165	.0027	.....	
118,000	.1198	.0033	.....	
120,000	.1240	.0042	.0158	Scale starts off.
122,000	.1284	.0044	.....	
124,000	.1322	.0038	.....	
126,000	.1370	.0048	.....	
128,000	.1430	.0060	.....	
130,000	.1524	.0094	.0343	
132,000	.1640	.0116	.....	
134,000	.1740	.0100	.....	
136,000	.1850	.0110	.....	
138,000	.2040	.0190	.....	
140,000	.2197	.0157	.0899	Test discontinued.

## HARDNESS OF STEEL RAILS.

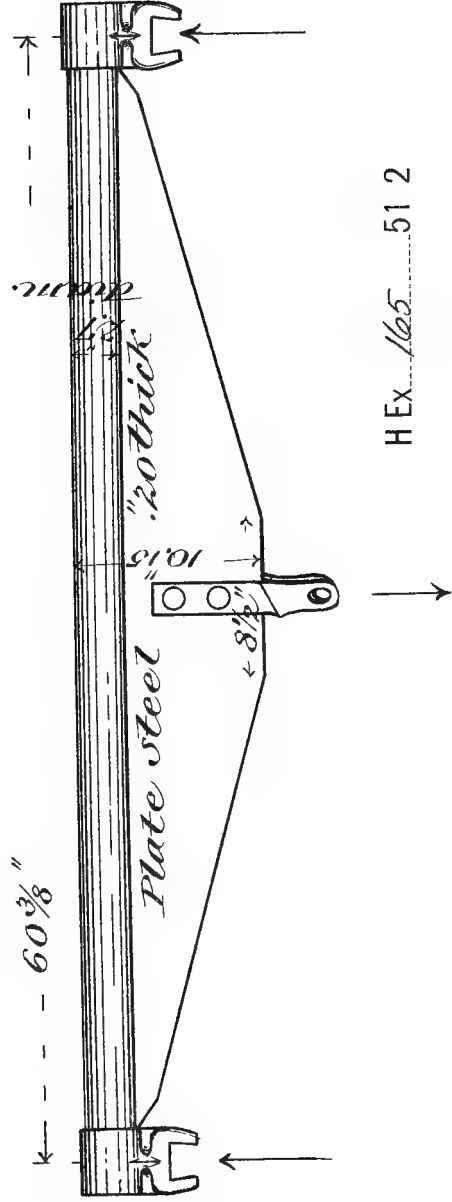
Transverse test number.	Mark.	Location of cut.	Hardness.
53	5115	Original surface of head, one end.....	25.73
		Original surface of head, other end.....	24.26*
54	5567	Original surface of head, one end.....	21.17
		Original surface of head, other end.....	22.64
55	5117	Original surface of head, one end.....	26.99
		Original surface of head, other end.....	26.99
56	5621	Original surface of head, one end.....	21.64
		Original surface of head, other end.....	21.64
57	5068	Original surface of head, one end.....	21.64
		Original surface of head, other end.....	22.39
58	5602	Original surface of head, one end.....	21.40
		Original surface of head, other end.....	21.17
59	5071	Original surface of head, one end.....	21.17
		$\frac{1}{8}$ " below original surface.....	25.73
		$\frac{2}{8}$ " below original surface.....	24.83
		$\frac{3}{8}$ " below original surface.....	25.13
		Original surface of head, other end.....	21.64
		$\frac{1}{8}$ " below original surface.....	26.67
		$\frac{2}{8}$ " below original surface.....	25.13
		$\frac{3}{8}$ " below original surface.....	25.43
60	5642	Original surface of head, one end.....	26.99
		$\frac{1}{8}$ " below original surface.....	25.73
		$\frac{2}{8}$ " below original surface.....	25.13
		$\frac{3}{8}$ " below original surface.....	25.13
		Original surface of head, other end.....	26.67
		$\frac{1}{8}$ " below original surface.....	25.13
		$\frac{2}{8}$ " below original surface.....	24.26
		$\frac{3}{8}$ " below original surface.....	25.13

\* Defective cut.



# Sketch of Brake Beam.

No. 4290



## RAILWAY BRAKE-BEAM.

No. 4290.

## TRANSVERSE TEST.

Weight of beam, including shoe-seat castings and brake-rod connection, 82 pounds.

Beam supported at ends on oak blocks resting against shoe castings.  
Loaded at the middle, pulling against brake-rod connections.

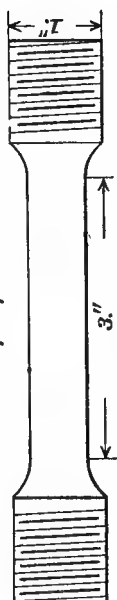
Applied loads.	Deflections.	Successive deflections,	Deflection sets.	Remarks.
<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	0.	0.	0.	Initial load.
1,000	.0038	.0038	.....	
2,000	.0098	.0060	.....	
3,000	.0158	.0060	.....	
4,000	.0225	.0067	.....	
5,000	.0310	.0085	.....	
6,000	.0393	.0083	.....	
7,000	.0435	.0042	.....	
8,000	.0502	.0067	.....	
9,000	.0557	.0055	.....	
10,000	.0628	.0071	.....	
11,000	.0681	.0053	.....	
12,000	.0741	.0060	.....	
13,000	.0808	.0067	.....	
14,000	.0880	.0072	.....	Snapping sounds.
15,000	.0932	.0052	.....	
16,000	.1003	.0071	.....	
17,000	.1049	.0046	.....	
18,000	.1106	.0057	.....	
19,000	.1170	.0064	.....	
20,000	.1230	.0060	.....	
21,000	.1305	.0075	.....	
22,000	.1363	.0058	.....	
23,000	.1453	.0090	.....	
24,000	.1505	.0052	.....	
25,000	.1552	.0047	.....	
26,000	.1625	.0073	.....	Snapping sounds repeated.
27,000	.1696	.0071	.....	
28,000	.1778	.0082	.....	
29,000	.1858	.0080	.....	
30,000	.1927	.0069	.0176	
31,000	.2005	.0078	.....	
32,000	.2065	.0060	.....	
33,000	.2172	.0107	.....	
34,000	.2261	.0089	.....	
35,000	.2383	.0122	.....	
36,000	.2488	.0105	.....	
37,000	.2630	.0142	.....	
38,000	.2800	.0170	.....	
39,000	.2993	.0193	.....	
40,000	.3180	.0187	.0834	
43,600	.....	.....	.....	Ultimate strength.

Fractured the brake-rod connection at the bottom of the forked part spanning the beam web.

H. Ex. 165—51

## TENSILE TESTS OF STEEL FOR 5-INCH SIEGE CARRIAGES.

Form of specimens.



No. of test.	Mark on specimen.	Dimensions.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 3 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
				Total.	Per square inch.	Total.	Per square inch.	Inches.	Pr. ct.				
4341	P R ..	Inches. Diam., .564	Sq. inch. .25	Pounds. 10,860	Pounds. 43,440	Pounds. 17,630	Pounds. 70,320	.28	9.3	Diam., .54=.229	Pr. ct. 8.4	Fine granular, with irregular shaped dull spot near center.	.10*, .09, .09
4342	P .....	Diam., .564	.25	8,610	34,440	14,270	57,080	.75	25.0	Diam., .38=.113	54.6	Silky .....	.46*, .17, .12
4343	B .....	Diam., .564	.25	9,250	37,120	14,690	56,360	1.03	34.3	Diam., .33=.086	65.6	do .....	.23*, .57, .23
4344	O B ..	Diam., .564	.25	13,870	53,380	16,280	65,120	.89	29.7	Diam., .35=.096	61.5	do .....	.17*, .48, .24

TENSILE TESTS OF STEEL REPRESENTING MATERIAL FOR USE IN 5-INCH SIEGE CARRIAGE.

No. of test.	Mark on spec. men.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
		Width.	Thick-ness.		Total.	Per square inch.	Total.	Per square inch.	In.	Pr. ct.				
		<i>Inches.</i>		<i>Sq. in.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>						
3365	4924a	1.020	.498	.508	16,749	32,950	26,820	52,730	2.13	26.6	"	Pr. ct.	Silky	" " " "
3366	4924a	1.010	.498	.501	16,680	33,280	27,000	54,090	2.26	28.2	.84 X .26 = 218	57.1	do	" " " "
3367	4924b	1.006	.497	.500	17,100	34,200	28,210	56,420	1.80	16.3	.81 X .26 = 211	57.9	do	" " " "
3368	4995a	1.024	.498	.510	18,340	35,960	27,490	53,900	2.06	25.7	.84 X .34 = 286	42.8	Silky, lamellar.	" " " "
3369	4995a	1.014	.498	.505	17,560	34,770	26,880	53,280	1.83	22.9	.77 X .23 = 177	65.3	do	" " " "
3370	4995b	1.016	.496	.504	17,600	34,920	28,320	56,190	2.00	25.0	.83 X .34 = 282	44.2	do	" " " "
											.80 X .34 = 272	46.0	do	" " " "
3757	A 1	.564	Diam.	.25	9,310	37,240	16,280	65,120	.95	31.7	.35 diam. = 0082	61.5	Fine, silky.	" " " "
3758	A 1	.564	do	.25	9,390	37,560	16,200	64,800	.90	30.0	.35 diam. = 0082	61.5	do	" " " "
3759	C 2	.564	do	.25	7,210	28,840	15,430	61,720	.90	30.0	.40 diam. = 1257	49.7	Silky, opened cracks in surface of stem in vicinity of fracture.	" " " "
3760	C 2	.564	do	.25	7,720	30,880	15,620	63,480	.79	26.3	.42 diam. = 1365	44.6	Silky, opened cracks in surface of stem in vicinity of fracture.	" " " "
3761	-----	1.017	.4985	.507	18,350	36,190	31,920	62,960	1.90	23.7	.74 X .32 = 244	51.9	Silky, slightly lamellar	" " " "
3762	-----	1.013	.2500	.253	19,080	47,750	16,760	66,350	1.59	19.9	.81 X .16 = 122	51.8	Silky	" " " "
3795	5073	1.490	.499	.744	28,850	38,790	48,960	65,810	2.08	26.0	1.12 X .35 = 392	47.3	Silky	" " " "
3796	5073	1.487	.496	.738	27,510	37,280	46,020	62,860	2.13	26.6	1.10 X .32 = 352	52.2	do	" " " "
3797	5073+	1.486	.510	.758	27,020	36,650	49,880	65,800	2.20	27.5	1.24 X .41 = 508	33.0	Silky, lamellar, had a stratified appearance.	" " " "

a Lengthwise.

b Crosswise.

## TENSILE TESTS OF STEEL PLATE FROM METAL FOR 5-INCH SIEGE CARRIAGE

No. of test.	Mark on specimen.	Dimensions.		Sec- tional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Con- traction of area.	Appearance of fracture.
		Width.	Thick- ness.		Total.	Per square inch.	Total.	Per square inch.	Inches.	Per ct.			
4339	S S	Inches. 1.00	Inch. .322	Sq. inch. .322	Pounds. 40,650	Pounds. 70,150	Pounds. 38,620	Pounds. 70,150	1.77	22.8	" Sq. in. 82 × 34 = 279	Per ct. 48.5	Silky.
4340	S S	1.00	.505	.505	40,650	70,150	34,020	67,370	1.77	22.8	82 × 32 = 271	48.3	Silky, contains a seam " 3 across.
4348	B	2.00	.557	1.01	38,500	64,360	67,180	66,510	2.00	25.0	1.66 × 40 = 664	34.3	Silky, lamellar.
4349	B	2.00	.501	.514	38,500	64,360	64,360	64,360	1.17	14.6	1.66 × 37 = 592	40.8	Do.
4950	B P	2.00	.257	.514	30,720	59,770	40,110	78,090	1.17	14.6	1.64 × 31 = 477	32.1	Do.
4351	B A P C	2.00	.452	.904	36,400	40,270	66,520	62,520	2.10	26.3	1.54 × 28 = 420	47.2	Do.
4352	B A P L	2.00	.441	.882	34,930	39,600	54,300	61,560	2.30	28.8	1.50 × 28 = 420	52.4	Do.
4353	T A P C	1.98	.251	.497	25,760	51,890	36,450	71,330	1.17*	14.6	1.64 × 17 = 279	43.9	Do.
4354	T A P L	2.00	.255	.510	26,580	52,120	34,890	68,410	1.43	17.9	1.77 × 17 = 301	41.0	Do.

\* Fractured outside the 8" gauged section.

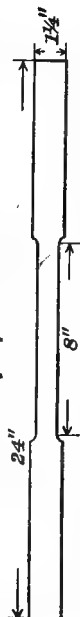


## WROUGHT IRON FOR 5-INCH SIEGE GUN CARRIAGE.

No. of test.	Marks.	Diameter. "	Sectional area.	Elastic limit.		Tensile strength.		Fracture.
				Total.	Per square inch.	Total.	Per square inch.	
2964	I	<i>Inch.</i> .564	<i>Sq. inch.</i> .25	<i>Pounds.</i> 7,300	<i>Pounds.</i> 29,200	<i>Pounds.</i> 12,910	<i>Pounds.</i> 51,640	Fibrous. Do.
2965	S	.564	.25	8,410	33,640	13,280	53,120	

## TENSILE TESTS OF SPECIMENS FROM CHEEK PLATES FOR 7-INCH SIEGE CARRIAGE.

Form of Specimens.



No. of test.	How taken.	Dimensions.		Sectional area.		Elastic limit.		Tensile strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Width.	Thick-ness.	Sq. in.	Pounds.	Total.	Per square inch.	Total.	Per square inch.	Inches.	Per ct.				
3879	Lengthwise.	1.000	.515	.515	37,510	33,170	64,410	33,170	64,410	1.93	24.1	.75 X .36 = 270	Per ct. 47.6	Silky	" " " " " "
3880	do .....	1.000	.508	.508	38,410	33,090	65,120	33,090	65,120	2.17	27.1	.75 X .35 = 263	48.2	do	.16, 23, .57*, 24, .21, 20, 18, 14
3881	Crosswise ..	1.000	.498	.498	36,750	31,590	63,490	31,590	63,490	1.97	24.6	.71 X .32 = 227	54.4	do	.14, 21, .55*, 26, .36, 32, 25, 18
3882	do .....	1.000	.507	.507	39,740	34,460	67,970	34,460	67,970	1.92	24.1	.71 X .34 = 241	52.5	do	.16, 18, 20, .37*, 47*, 23, 20, 17
															.17, 16, 17, .18, .22, .37*, 47*, 18

---

# STEEL BARS

FROM

ORDNANCE OFFICE, WASHINGTON, D. C.

---



## SPECIMENS TURNED DOWN FROM BARS ".95 SQUARE.

No. 4053.

Mark, 1.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000250	.000150	.....	.....	
5,000	20,000	.000500	.000250	.....	.....	
7,500	30,000	.000850	.000350	.....	.....	
10,000	40,000	.001200	.000350	0.	.....	
11,250	45,000	.001400	.000200	.....	.....	
12,500	50,000	.001550	.000150	.....	.....	
13,750	55,000	.001800	.000250	.....	.....	
15,000	60,000	.001950	.000150	0.	.....	
15,500	62,000	.002000	.000050	.....	.....	
16,000	64,000	.002050	.000050	.....	.....	
16,500	66,000	.002100	.000050	.....	.....	
17,000	68,000	.002150	.000050	.....	.....	
17,500	70,000	.002250	.000100	.....	.....	
18,000	72,000	.002350	.000100	.....	.....	
18,500	74,000	.002400	.000050	.....	.....	
19,000	76,000	.002500	.000100	.....	.....	
19,500	78,000	.002550	.000050	.....	.....	
20,000	80,000	.002600	.000050	.....	.....	
20,500	82,000	.002650	.000050	.....	.....	
21,000	84,000	.002800	.000150	.....	.....	
21,500	86,000	.002900	.000100	.....	.....	
22,000	88,000	.002950	.000050	.....	.....	
22,500	90,000	.003000	.000050	.....	.....	
23,000	92,000	.003050	.000050	.....	.....	
23,500	94,000	.003100	.000050	.....	.....	
24,000	96,000	.003150	.000050	.....	.....	
24,500	98,000	.003200	.000050	.....	.....	
25,000	100,000	.003250	.000050	0.	.....	
25,500	102,000	.003400	.000150	.....	.....	
26,000	104,000	.003450	.000050	.....	.....	
26,500	106,000	.003500	.000050	.....	.....	
27,000	108,000	.003550	.000050	.....	.....	
27,500	110,000	.003750	.000200	.....	.....	
28,000	112,000	.003950	.000200	.000050	.000050	
28,500	114,000	.004050	.000100	.....	.....	
29,000	116,000	.004300	.000250	.....	.....	
29,500	118,000	.004400	.000100	.....	.....	Elastic limit.
30,000	120,000	.004850	.000450	.000550	.000500	
33,140	132,560	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 132,560  
 Elastic limit per square inch of original section ..... do... 118,000  
 Elongation per inch after rupture ..... Inappreciable  
 Elongation per inch under strain at elastic limit ..... inch... .00440  
 Reduction in diameter at point of rupture ..... Inappreciable  
 Reduction in area after rupture, per centum of original section ..... Inappreciable  
 Position of rupture ..... ".6 from neck  
 Character of broken surface ..... fine granular

No. 4054.

Marks, 2.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000350	.000250	0.	0.	
5,000	20,000	.000600	.000250	0.	0.	
7,500	30,000	.000950	.000350	0.	0.	
10,000	40,000	.001300	.000350	0.	0.	
12,500	50,000	.001600	.000300	0.	0.	
13,750	55,000	.001800	.000200	0.	0.	
15,000	60,000	.001950	.000150	0.	0.	
15,500	62,000	.002000	.000050	0.	0.	
16,000	64,000	.002050	.000050	0.	0.	
16,500	66,000	.002100	.000050	0.	0.	
17,000	68,000	.002150	.000050	0.	0.	
17,500	70,000	.002300	.000150	0.	0.	
18,000	72,000	.002350	.000050	0.	0.	
18,500	74,000	.002400	.000050	0.	0.	
19,000	76,000	.002500	.000100	0.	0.	
19,500	78,000	.002550	.000050	0.	0.	
20,000	80,000	.002600	.000050	0.	0.	
20,500	82,000	.002650	.000050	0.	0.	
21,000	84,000	.002750	.000100	0.	0.	
21,500	86,000	.002850	.000100	0.	0.	
22,000	88,000	.002900	.000050	0.	0.	
22,500	90,000	.002950	.000050	0.	0.	
23,000	92,000	.003000	.000050	0.	0.	
23,500	94,000	.003050	.000050	0.	0.	
24,000	96,000	.003100	.000050	0.	0.	
24,500	98,000	.003200	.000100	0.	0.	
25,000	100,000	.003350	.000150	.000050	.000050	Elastic limit.
25,500	102,000	.003350	0.	0.	0.	
26,000	104,000	.003400	.000050	0.	0.	
26,500	106,000	.003450	.000050	0.	0.	
27,000	108,000	.003600	.000150	0.	0.	
27,500	110,000	.004900	.001300	.001250	.001200	Tensile strength.
42,100	168,400					

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 168,400  
 Elastic limit per square inch of original section ..... do .. 108,000  
 Elongation per inch after rupture ..... inch.. .040  
 Elongation per inch under strain at elastic limit ..... do .. .003600  
 Reduction in diameter at point of rupture ..... do .. .014  
 Reduction in area after rupture, per centum of original section ..... 5.0  
 Position of rupture ..... ".70 from neck  
 Character of broken surface ..... granular, flaky

---

---

**STEEL SPECIMENS**

**FROM**

**MIDVALE STEEL COMPANY.**

**Tests for comparison of testing machines.**





## No. 3918.

Marks, M D V S T N D.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	-----	
2,500	10,000	.000300	.000175	-----	-----	
3,750	15,000	.000425	.000125	-----	-----	
5,000	20,000	.000550	.000125	-----	-----	
6,250	25,000	.000700	.000150	-----	-----	
7,500	30,000	.000900	.000200	-----	-----	
8,750	35,000	.001075	.000175	-----	-----	
10,000	40,000	.001225	.000150	-----	-----	
11,250	45,000	.001400	.000175	-----	-----	
12,500	50,000	.001575	.000175	-----	-----	

## No. 3919.

Marks, M D V S T N D.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000125	.000125	0.	-----	
2,500	10,000	.000275	.000150	-----	-----	
3,750	15,000	.000400	.000125	-----	-----	
5,000	20,000	.000550	.000150	-----	-----	
6,250	25,000	.000675	.000125	-----	-----	
7,500	30,000	.000875	.000200	-----	-----	
8,750	35,000	.001025	.000150	-----	-----	
10,000	40,000	.001200	.000175	-----	-----	
11,250	45,000	.001375	.000175	-----	-----	
12,500	50,000	.001550	.000175	0.	-----	

## No. 3920.

Marks, M D V S T N D.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000233	.000133	-----	-----	
3,750	15,000	.000433	.000200	-----	-----	
5,000	20,000	.000600	.000167	-----	-----	
6,250	25,000	.000767	.000167	-----	-----	
7,500	30,000	.000933	.000166	-----	-----	
8,750	35,000	.001100	.000167	-----	-----	
10,000	40,000	.001267	.000167	-----	-----	
11,250	45,000	.001433	.000166	-----	-----	
12,500	50,000	.001600	.000167	0.	-----	

## No. 3921.

Marks, M D V S T N D.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	-----	
2,500	10,000	.000267	.000167	-----	-----	
3,750	15,000	.000433	.000166	-----	-----	
5,000	20,000	.000600	.000167	-----	-----	
6,250	25,000	.000767	.000167	-----	-----	
7,500	30,000	.000933	.000166	-----	-----	
8,750	35,000	.001100	.000167	-----	-----	
10,000	40,000	.001267	.000167	-----	-----	
11,250	45,000	.001433	.000166	-----	-----	
12,500	50,000	.001600	.000167	0.	-----	

---

# STEEL SPECIMENS

TAKEN FROM

THREE BARS OF STEEL FURNISHED BY THE BETHLEHEM  
IRON COMPANY, SOUTH BETHLEHEM, PA.

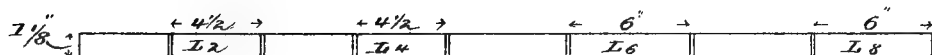
Alternate specimens tested at South Bethlehem, Pa.

---

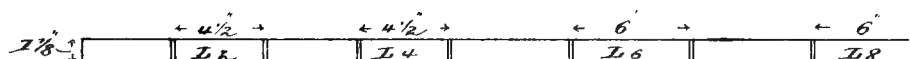


# *Location of specimens in bars*

*Bar No. 1*



*Bar No. 2*



*Bar No. 3*





No. 3944.

Marks,  $C T_1$   
 $L_2$ 

Diameters: End, ".5054; middle, ".5046; end, ".5052.

Sectional area, .20 square inch.

Gauged length, 2'.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000250	.000150	.....	.....	
3,000	15,000	.000450	.000200	.....	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	.....	.....	
6,000	30,000	.000950	.000200	0.	.....	
6,200	31,000	.001000	.000050	.....	.....	
6,400	32,000	.001050	.000050	.....	.....	
6,600	33,000	.001100	.000050	.....	.....	
6,800	34,000	.001100	0.	.....	.....	
7,000	35,000	.001150	.000050	0.	.....	
7,200	36,000	.001200	.000050	.....	.....	
7,400	37,000	.001250	.000050	.....	.....	
7,600	38,000	.001300	.000050	.....	.....	
7,800	39,000	.001350	.000050	.....	.....	
8,000	40,000	.001350	0.	.....	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001450	0.	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	Elastic limit.
9,000	45,000	.001600	.000100	.....	.....	
9,200	46,000	.002250	.010750	.....	.....	
9,400	47,000	.012750	.000400	.....	.....	
9,600	48,000	.012350	.000600	.....	.....	
10,000	50,000	.014400	.001050	.....	.....	
10,400	52,000	.016450	.001050	.....	.....	
10,800	54,000	.018950	.002500	.....	.....	
11,200	56,000	.021250	.002300	.....	.....	
11,600	58,000	.023950	.002700	.....	.....	
12,000	60,000	.027150	.003200	.....	.....	
12,400	62,000	.030500	.003350	.....	.....	
12,800	64,000	.033000	.003400	.....	.....	
13,200	66,000	.036150	.004250	.....	.....	
13,600	68,000	.041950	.003800	.....	.....	
14,000	70,000	.047350	.005400	.....	.....	
14,400	72,000	.055100	.007750	.....	.....	
14,800	74,000	.0575	.0024	.....	.....	
15,200	76,000	.0700	.0125	.....	.....	
15,600	78,000	.0800	.0100	.....	.....	
16,000	80,000	.1000	.0200	.....	.....	
16,390	81,950	.1200	.0200	.....	.....	Tensile strength. At time of rupture.
13,580	.....	.1950	.0750	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	81,950
Elastic limit per square inch of original section.....	do...	45,000
Elongation per inch after rupture.....	inch.....	.3050
Elongation per inch under strain at elastic limit.....	do.....	.001600
Reduction in diameter at point of rupture.....	do.....	.145
Reduction in area after rupture, per centum of original section.....	.....	49.1
Position of rupture.....	.....	1".15 from neck
Character of broken surface.....	.....	fine silky
Elongation of inch sections.....	.....	".41*, ".20

H. Ex. 165—52

No. 3945.

Marks, <sup>C T</sup><sub>L<sub>4</sub></sub>

Diameters: End, ".5047; middle, ".5046; end, ".5051.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	0.	
2,000	10,000	.000250	.000150	.....	.....	
3,000	15,000	.000450	.000200	.....	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000900	.000150	.....	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	.....	.....	
8,000	40,000	.001300	.000150	0.	.....	
8,200	41,000	.001300	0.	.....	.....	
8,400	42,000	.001350	.000050	.....	.....	Elastic limit.
8,600	43,000	.001400	.000050	.....	.....	
8,800	44,000	.001450	.000050	.....	.....	
9,000	45,000	.001500	.000050	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.013750	.012250	.....	.....	
9,600	48,000	.014050	.000300	.....	.....	
10,000	50,000	.015750	.001700	.....	.....	
10,400	52,000	.018050	.002300	.....	.....	
10,800	54,000	.020250	.002200	.....	.....	
11,200	56,000	.022800	.002550	.....	.....	
11,600	58,000	.025350	.002550	.....	.....	
12,000	60,000	.028050	.002700	.....	.....	
12,400	62,000	.031550	.003500	.....	.....	
12,800	64,000	.035000	.003550	.....	.....	
13,200	66,000	.039150	.004150	.....	.....	
13,600	68,000	.044150	.005900	.....	.....	
14,000	70,000	.049250	.005100	.....	.....	
14,400	72,000	.057000	.007750	.....	.....	
14,800	74,000	.0600	.0030	.....	.....	
15,200	76,000	.0700	.0100	.....	.....	
15,600	78,000	.0850	.0150	.....	.....	
16,000	80,000	.1050	.0200	.....	.....	
16,400	82,000	.1500	.0450	.....	.....	
16,420	82,100	.....	.....	.....	.....	Tensile strength. At time of fracture.
18,800	.....	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	82,100
Elastic limit per square inch of original section .....	do....	46,000
Elongation per inch after rupture .....	inch..	.3000
Elongation per inch under strain at elastic limit .....	do....	.001500
Reduction in diameter at point of rupture .....	do....	.145
Reduction in area after rupture, per centum of original section .....		49.1
Position of rupture .....	at middle of stem	
Character of broken surface .....	fine silky	
Elongation of inch sections .....	" .29", ".31"	



No. 3946.

Marks, C T,  
L<sub>6</sub>

Diameters: End, ".5654; middle, ".5645; end, ".5654.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	.....	.....	
3,750	15,000	.000533	.000200	.....	.....	
5,000	20,000	.000700	.000167	0.	.....	
6,250	25,000	.000833	.000133	.....	.....	
7,500	30,000	.001067	.000234	.....	.....	
8,750	35,000	.001267	.000200	.....	.....	
10,000	40,000	.001400	.000133	.000067	.000067	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001467	.000034	.....	.....	
10,750	43,000	.001500	.000033	.....	.....	Elastic limit.
11,000	44,000	.001533	.000033	.....	.....	
11,250	45,000	.001567	.000034	.....	.....	
11,500	46,000	.001633	.000066	.....	.....	
		.014333	.012700	.....	.....	
11,750	47,000	.014500	.000167	.....	.....	
12,000	48,000	.014400	.000100	.....	.....	
12,250	49,000	.015000	.000400	.....	.....	
12,500	50,000	.015333	.001333	.....	.....	
13,000	52,000	.018833	.002500	.....	.....	
13,500	54,000	.020833	.002000	.....	.....	Tensile strength. At time of fracture.
14,000	56,000	.023400	.002567	.....	.....	
14,500	58,000	.026167	.002767	.....	.....	
15,000	60,000	.029333	.003166	.....	.....	
15,500	62,000	.033000	.003667	.....	.....	
16,000	64,000	.036500	.003500	.....	.....	
16,500	66,000	.040067	.003567	.....	.....	
17,000	68,000	.046667	.006600	.....	.....	
17,500	70,000	.0533	.006633	.....	.....	
18,000	72,000	.0600	.0067	.....	.....	
18,500	74,000	.0667	.0067	.....	.....	
19,000	76,000	.0733	.0066	.....	.....	Tensile strength. At time of fracture.
19,500	78,000	.0933	.0200	.....	.....	
20,000	80,000	.1133	.0200	.....	.....	
20,400	81,600	.1900	.0767	.....	.....	
16,700	.....	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 81,600  
 Elastic limit per square inch of original section ..... do... 46,000  
 Elongation per inch after rupture ..... inch... .2667  
 Elongation per inch under strain at elastic limit ..... do... .001633  
 Reduction in diameter at point of rupture ..... do... .184  
 Reduction in area after rupture, per centum of original section ..... 54.6  
 Position of rupture ..... at middle of stem  
 Character of broken surface ..... fine silky  
 Elongation of inch sections ..... ".16, ".46, ".18

No. 3947.

Marks, C T,  
L<sub>s</sub>

Diameters: End, ".5642; middle, ".5642; end, ".5643.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	0.	
2,500	10,000	.000333	.000200	0.	0.	
3,750	15,000	.000533	.000200	0.	0.	
5,000	20,000	.000700	.000167	.000033	.000033	
6,250	25,000	.000867	.000167	0.	0.	
7,500	30,000	.001067	.000200	0.	0.	
8,750	35,000	.001267	.000200	0.	0.	
10,000	40,000	.001467	.000200	.000033	0.	
10,250	41,000	.001500	.000033	0.	0.	
10,500	42,000	.001533	.000033	0.	0.	
10,750	43,000	.001567	.000033	0.	0.	
11,000	44,000	.001600	.000033	0.	0.	Elastic limit.
11,250	45,000	.010833	.009233	0.	0.	
11,500	46,000	.012667	.001834	0.	0.	
11,750	47,000	.013133	.000466	0.	0.	
12,000	48,000	.013967	.000834	0.	0.	
12,500	50,000	.016333	.002366	0.	0.	
13,000	52,000	.018267	.001934	0.	0.	
13,500	54,000	.020500	.002233	0.	0.	
14,000	56,000	.023267	.002767	0.	0.	
14,500	58,000	.025567	.002300	0.	0.	
15,000	60,000	.028800	.003233	0.	0.	
15,500	62,000	.031733	.002933	0.	0.	
16,000	64,000	.036233	.004500	0.	0.	
16,500	66,000	.040600	.004367	0.	0.	
17,000	68,000	.0433	.0027	0.	0.	
17,500	70,000	.0500	.0067	0.	0.	
18,000	72,000	.0567	.0067	0.	0.	
18,500	74,000	.0633	.0066	0.	0.	
19,000	76,000	.0733	.0100	0.	0.	
19,500	78,000	.0900	.0167	0.	0.	
20,000	80,000	.1067	.0167	0.	0.	
20,500	82,000	.1600	.0533	0.	0.	
20,510	82,040					Tensile strength.
17,200						At time of fracture.

*General summary.*

Tensile strength per square inch of original section.....pounds.. 82,040  
 Elastic limit per square inch of original section.....do... 44,000  
 Elongation per inch after rupture.....inch... .2767  
 Elongation per inch under strain at elastic limit.....do... .001600  
 Reduction in diameter at point of rupture.....do... .174  
 Reduction in area after rupture, per centum of original section.....1".65 from neck  
 Position of rupture.....fine silky  
 Character of broken surface.....  
 Elongation of inch sections.....".19, ".47, ".17

No. 3948.

Marks, C T,  
L<sub>2</sub>

Diameters: End, ".5047; middle, ".5048; end, ".5051.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000300	.000200			
3,000	15,000	.000450	.000150			
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000850	.000200			
6,000	30,000	.001050	.000200			
7,000	35,000	.001250	.000200			
8,000	40,000	.001400	.000150	.000050	.000050	
9,000	45,000	.001500	.000100			
10,000	50,000	.001650	.000150			Elastic limit.
10,200	51,000	.001700	.000050			
10,400	52,000	.001750	.000050			
10,600	53,000	.001800	.000050			
10,800	54,000	.001800	0.			
11,000	55,000	.0017900	.000100			
11,200	56,000	.001750	.000850			
11,600	58,000	.011000	.002250			
12,000	60,000	.012950	.001950			
12,400	62,000	.015000	.002050			
12,800	64,000	.017500	.002500			
13,200	66,000	.020000	.002500			
13,600	68,000	.022600	.002600			
14,000	70,000	.025400	.002800			
14,400	72,000	.028650	.003250			
14,800	74,000	.032000	.003350			
15,200	76,000	.035250	.003250			Tensile strength. At time of fracture.
15,600	78,000	.040150	.004900			
16,000	80,000	.047900	.007750			
16,400	82,000	.0525	.0046			
16,800	84,000	.0600	.0075			
17,200	86,000	.0850	.0250			
17,830	89,150					
13,500						

*General summary.*

Tensile strength per square inch of original section.....	pounds..	89,150
Elastic limit per square inch of original section.....	do...	54,000
Elongation per inch after rupture.....	inch.....	.285
Elongation per inch under strain at elastic limit.....	do.....	.001800
Reduction in diameter at point of rupture.....	do.....	.165
Reduction in area after rupture, per centum of original section.....		59.8
Position of rupture.....	at middle of stem	
Character of broken surface.....	fine silky	
Elongation of inch sections.....	" .27", ".30"	

No. 3949.

Marks, C T<sub>2</sub>  
L<sub>4</sub>

Diameters: End, ".5055; middle, ".5049; end, ".5054.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000250	.000150	0.		
3,000	15,000	.000450	.000200			
4,000	20,000	.000600	.000150	0.		
5,000	25,000	.000800	.000200			
6,000	30,000	.000950	.000150			
7,000	35,000	.001100	.000150			
8,000	40,000	.001300	.000200	.000050	.000050	
9,000	45,000	.001450	.000150			
9,200	46,000	.001450	0.			Elastic limit.
9,400	47,000	.001500	.000050			
9,600	48,000	.001550	.000050			
9,800	49,000	.001550	0.			
10,000	50,000	.001600	.000050	0.	.000050	
10,200	51,000	.001650	.000050			
10,400	52,000	.001700	.000050			
10,600	53,000	.001650	.0002950			
10,800	54,000	.0017400	.000750			
11,200	56,000	.0019050	.001650			
11,600	58,000	.011500	.002450			
12,000	60,000	.013500	.002000			
12,400	62,000	.015600	.002100			
12,800	64,000	.018250	.002650			
13,200	66,000	.020700	.002450			
13,600	68,000	.023200	.002500			
14,000	70,000	.025750	.002550			
14,400	72,000	.028650	.002900			
14,800	74,000	.032800	.004150			
15,200	76,000	.036750	.003950			
15,600	78,000	.041350	.004100			
16,000	80,000	.049100	.007750			
16,400	82,000	.0550	.0059			
16,800	84,000	.0625	.0075			
17,200	86,000	.0850	.0225			
17,600	88,000	.1100	.0250			
17,720	88,600	.1650	.0550			
13,700						Tensile strength. At time of fracture.

## General summary.

Tensile strength per square inch of original section.....	pounds..	88,600
Elastic limit per square inch of original section.....	do..	52,000
Elongation per inch after rupture.....	inch..	.2800
Elongation per inch under strain at elastic limit.....	do..	.001700
Reduction in diameter at point of rupture.....	do..	.175
Reduction in area after rupture, per centum of original section.....		57.2
Position of rupture.....		1" .20 from neck
Character of broken surface.....		fine silky
Elongation of inch sections.....		".35, * ".21

No. 3950.

Marks, C T,  
L<sub>g</sub>

Diameters: End, ".5642; middle, ".5643; end, ".5643.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	.....	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000367	.000200	.....	.....	
3,750	15,000	.000533	.000166	.....	.....	
5,000	20,000	.000733	.000200	.000033	.000033	
6,250	25,000	.000900	.000167	.....	.....	
7,500	30,000	.001067	.000167	.....	.....	
8,750	35,000	.001233	.000166	.....	.....	
10,000	40,000	.001433	.000200	.000100	.000067	
11,250	45,000	.001633	.000200	.....	.....	
11,500	46,000	.001633	0.	.....	.....	Elastic limit.
11,750	47,000	.001667	.000034	.....	.....	
12,000	48,000	.001700	.000033	.....	.....	
12,250	49,000	.001733	.000033	.....	.....	
12,500	50,000	.001767	.000034	.....	.....	
12,750	51,000	.001800	.000033	.....	.....	
13,000	52,000	.001867	.000067	.....	.....	
13,250	53,000	.002000	.000733	.....	.....	
13,500	54,000	.006333	.003733	.....	.....	
14,000	56,000	.008500	.002167	.....	.....	
14,500	58,000	.010500	.002000	.....	.....	
15,000	60,000	.012333	.001833	.....	.....	
15,500	62,000	.014600	.002267	.....	.....	
16,000	64,000	.016933	.002333	.....	.....	
16,500	66,000	.019200	.002267	.....	.....	
17,000	68,000	.021733	.002533	.....	.....	
17,500	70,000	.024500	.002767	.....	.....	
18,000	72,000	.027100	.002600	.....	.....	
18,500	74,000	.030667	.003567	.....	.....	
19,000	76,000	.034500	.003833	.....	.....	
19,500	78,000	.038667	.004167	.....	.....	Tensile strength. At time of fracture.
20,000	80,000	.04167	.003003	.....	.....	
20,500	82,000	.0500	.00833	.....	.....	
21,000	84,000	.0600	.0100	.....	.....	
21,500	86,000	.0667	.0067	.....	.....	
22,000	88,000	.0867	.0200	.....	.....	
22,320	89,280	.1333	.0466	.....	.....	
16,900	.....	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section.....	pounds..	89,280
Elastic limit per square inch of original section.....	do...	52,000
Elongation per inch after rupture.....	inch..	.2400
Elongation per inch under strain at elastic limit.....	do...	.001867
Reduction in diameter at point of rupture.....	do...	.204
Reduction in area after rupture, per centum of original section.....		59.3
Position of rupture.....	1", 25 from neck	
Character of broken surface.....	fine silky	
Elongation of inch sections.....	"29", "30", "13	

No. 3951.

Marks,  $C T_2$   
 $L_s$ 

Diameters: End, ".5643; middle, ".5642; end, ".5642.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
3,750	15,000	.000500	.000167	.....	.....	
5,000	20,000	.000700	.000200	.000033	.000033	
6,250	25,000	.000933	.000233	.....	.....	
7,500	30,000	.001167	.000234	.....	.....	
8,750	35,000	.001333	.000166	.....	.....	
10,000	40,000	.001500	.000167	.000100	.000067	
11,250	45,000	.001667	.000167	.....	.....	
11,500	46,000	.001700	.000033	.....	.....	Elastic limit.
11,750	47,000	.001700	0.	.....	.....	
12,000	48,000	.001733	.000033	.....	.....	
12,250	49,000	.001767	.000034	.....	.....	
12,500	50,000	.001800	.000033	.....	.....	
12,750	51,000	.001833	.000033	.....	.....	
13,000	52,000	.002000	.000167	.....	.....	
13,250	53,000	.003333	.001333	.....	.....	
13,500	54,000	.006667	.003334	.....	.....	
14,000	56,000	.009000	.002333	.....	.....	
14,500	58,000	.010567	.001567	.....	.....	
15,000	60,000	.012733	.002166	.....	.....	
15,500	62,000	.014667	.001934	.....	.....	
16,000	64,000	.016900	.002233	.....	.....	
16,500	66,000	.019167	.002267	.....	.....	
17,000	68,000	.021567	.002400	.....	.....	Tensile strength. At time of fracture.
17,500	70,000	.024300	.002733	.....	.....	
18,000	72,000	.027500	.003200	.....	.....	
18,500	74,000	.030733	.003233	.....	.....	
19,000	76,000	.034500	.003767	.....	.....	
19,500	78,000	.038667	.004167	.....	.....	
20,000	80,000	.0433	.004633	.....	.....	
20,500	82,000	.0500	.0067	.....	.....	
21,000	84,000	.0567	.0067	.....	.....	
21,500	86,000	.0667	.0100	.....	.....	
22,000	88,000	.0900	.0233	.....	.....	
22,220	88,880	.1233	.0333	.....	.....	
17,300	.....	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	88,880
Elastic limit per square inch of original section.....	do...	51,000
Elongation per inch after rupture.....	inch..	.2467
Elongation per inch under strain at elastic limit.....	do...	.001833
Reduction in diameter at point of rupture.....	do...	.204
Reduction in area after rupture, per centum of original section.....		59.3
Position of rupture.....		1/45 from neck
Character of broken surface.....		fine silky
Elongation of inch sections.....		".13, ".42, ".19

No. 3952.

Marks,  $CT_2$   
 $L_{10}$ 

Diameters: End, ".5500; middle, ".5496; .2 in. ch from end, ".5500.

Sectional area, .237 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
237	1,000	0.	0.	0.	0.	Initial load.
1,185	5,000	.000175	.000175	0.	0.	
2,370	10,000	.000375	.000200	0.	0.	
3,555	15,000	.000525	.000150	0.	0.	
4,740	20,000	.000675	.000150	0.	0.	
5,925	25,000	.000875	.000200	0.	0.	
7,110	30,000	.001050	.000175	0.	0.	
8,295	35,000	.001200	.000150	0.	0.	
9,480	40,000	.001350	.000150	0.	0.	
10,665	45,000	.001550	.000200	0.	0.	
10,902	46,000	.001575	.000025	0.	0.	
11,139	47,000	.001625	.000050	0.	0.	
11,376	48,000	.001650	.000025	0.	0.	
11,613	49,000	.001700	.000050	0.	0.	
11,850	50,000	.001725	.000025	0.	0.	
12,087	51,000	.001775	.000050	0.	0.	Elastic limit.
12,324	52,000	.001825	.000050	0.	0.	
12,561	53,000	.002875	.001050	0.	0.	
12,798	54,000	.007675	.004800	0.	0.	
13,272	56,000	.009500	.001825	0.	0.	
13,746	58,000	.011125	.001625	0.	0.	
14,220	60,000	.013475	.002350	0.	0.	
14,694	62,000	.015750	.002275	0.	0.	
15,168	64,000	.018125	.002375	0.	0.	
15,642	66,000	.019900	.001775	0.	0.	
16,116	68,000	.023000	.003100	0.	0.	
16,590	70,000	.023625	.000625	0.	0.	
17,064	72,000	.026375	.002750	0.	0.	
17,538	74,000	.031875	.005500	0.	0.	
18,012	76,000	.0350	.004125	0.	0.	
18,486	78,000	.0425	.0075	0.	0.	
18,960	80,000	.0500	.0075	0.	0.	
19,434	82,000	.0575	.0075	0.	0.	
19,908	84,000	.0650	.0075	0.	0.	
20,382	86,000	.0775	.0125	0.	0.	
20,856	88,000	.1050	.0275	0.	0.	Tensile strength. At time of fracture.
20,910	88,230	.1250	.0200	0.	0.	
16,100						

*General summary.*

Tensile strength per square inch of original section .....	pounds..	88,230
Elastic limit per square inch of original section .....	do..	52,000
Elongation per inch after rupture .....	inch..	.2300
Elongation per inch under strain at elastic limit .....	do..	.001825
Reduction in diameter at point of rupture .....	do..	.200
Reduction in area after rupture, per centum of original section .....		59.4
Position of rupture .....		2".40 from neck
Character of broken surface .....		fine silky
Elongation of inch sections .....		".13, ".37, ".30, ".12

No. 3953.

Marks, <sup>C</sup> T,  
<sub>L</sub> 2

Diameters: End, ".5505; middle, ".5490; end, ".5510, tapers rapidly.

Sectional area, .237 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
237	1,000	0.	0.	0.	0.	Initial load.
1,185	5,000	.000125	.000125	0.	0.	
2,370	10,000	.000325	.000200	.....	.....	
3,555	15,000	.000500	.000175	.....	.....	
4,740	20,000	.000675	.000175	.....	.....	
5,925	25,000	.000825	.000150	.....	.....	
7,110	30,000	.001000	.000175	.....	.....	
8,295	35,000	.001175	.000175	.....	.....	
9,480	40,000	.001325	.000150	0.	.....	
10,665	45,000	.001500	.000175	.....	.....	
10,902	46,000	.001550	.000050	.....	.....	
11,139	47,000	.001575	.000025	.....	.....	
11,376	48,000	.001625	.000050	.....	.....	
11,613	49,000	.001650	.000025	.....	.....	
11,850	50,000	.001675	.000025	.....	.....	
12,087	51,000	.001725	.000050	.....	.....	
12,324	52,000	.001750	.000025	.....	.....	
12,561	53,000	.001775	.000025	.....	.....	
12,798	54,000	.001825	.000050	.....	.....	Elastic limit.
13,035	55,000	.003250	.001425	.....	.....	
13,272	56,000	.007430	.004300	.....	.....	
13,746	58,000	.008300	.001350	.....	.....	
14,220	60,000	.011250	.002450	.....	.....	
14,694	62,000	.013450	.002200	.....	.....	
15,168	64,000	.015700	.002250	.....	.....	
15,642	66,000	.017500	.001800	.....	.....	
16,116	68,000	.020175	.002075	.....	.....	
16,590	70,000	.023000	.002825	.....	.....	
17,064	72,000	.026100	.003100	.....	.....	
17,538	74,000	.028625	.003525	.....	.....	
18,012	76,000	.03125	.002625	.....	.....	
18,486	78,000	.03750	.00625	.....	.....	
18,960	80,000	.04375	.00625	.....	.....	
19,434	82,000	.0500	.00625	.....	.....	
19,908	84,000	.0550	.0050	.....	.....	
20,382	86,000	.0650	.0100	.....	.....	
20,856	88,000	.0800	.0150	.....	.....	
21,330	90,000	.1300	.0500	.....	.....	Tensile strength. At time of fracture.
16,200	.....	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section..... pounds.. 90,000  
 Elastic limit per square inch of original section..... do... 54,000  
 Elongation per inch after rupture..... inch... .2175  
 Elongation per inch under strain at elastic limit..... do... .001825  
 Reduction in diameter at point of rupture..... do... .200  
 Reduction in area after rupture, per centum of original section..... 58.4  
 Position of rupture..... 2".25 from neck  
 Character of broken surface..... fine silky  
 Elongation of inch sections..... ".11, ".20, ".43, ".13



No. 3954.

Marks,  $C T_1$   
 $L_2$ 

Diameters: End, ".5056; middle, ".5046+; end, ".5048.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.000150	.000150	0.	0.	
2,000	10,000	.000300	.000150	.....	.....	
3,000	15,000	.000400	.000100	.....	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	.....	.....	
6,000	30,000	.000950	.000200	.....	.....	
7,000	35,000	.001100	.000150	.....	.....	
8,000	40,000	.001300	.000200	.000050	.000050	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
11,000	55,000	.001850	.000200	.....	.....	
12,000	60,000	.002000	.000150	.000100	.000050	
13,000	65,000	.002250	.000250	.....	.....	
14,000	70,000	.002400	.000150	.....	.....	Elastic limit.
14,200	71,000	.002490	0.	.....	.....	
14,400	72,000	.002450	.000050	.....	.....	
14,600	73,000	.002500	.000050	.....	.....	
14,800	74,000	.002500	0.	.....	.....	
15,000	75,000	.002550	.000050	.....	.....	
15,200	76,000	.002550	0.	.....	.....	
15,400	77,000	.002600	.000050	.....	.....	
15,600	78,000	.003600	.001000	.....	.....	
15,800	79,000	.008250	.004650	.....	.....	
16,000	80,000	.008750	.000500	.....	.....	
16,400	82,000	.010100	.001350	.....	.....	
16,800	84,000	.011600	.001500	.....	.....	
17,200	86,000	.013100	.001500	.....	.....	
17,600	88,000	.014700	.0.1600	.....	.....	Tensile strength.
18,000	90,000	.016650	.0.1950	.....	.....	
18,400	92,000	.018000	.001350	.....	.....	
18,800	94,000	.019750	.001750	.....	.....	
19,200	96,000	.021300	.0.1550	.....	.....	
19,600	98,000	.023600	.002300	.....	.....	
20,000	100,000	.025500	.0019.0	.....	.....	
20,400	102,000	.027450	.001950	.....	.....	
20,800	104,000	.030850	.0034.0	.....	.....	
21,200	106,000	.032600	.001750	.....	.....	
21,600	108,000	.036250	.003650	.....	.....	
22,000	110,000	.040000	.003750	.....	.....	
22,800	114,000	.0500	.0100	.....	.....	
23,600	118,000	.0575	.0075	.....	.....	
24,400	122,000	.1075	.0500	.....	.....	
24,410	122,050	.....	.....	.....	.....	

## General summary.

Tensile strength per square inch of original section.....pounds.. 122,050  
 Elastic limit per square inch of original section.....do... 77,000  
 Elongation per inch after rupture.....inch... .2050  
 Elongation per inch under strain at elastic limit.....do... .002600  
 Reduction in diameter at point of rupture.....do... .135  
 Reduction in area after rupture, per centum of original section.....do... 46.2  
 Position of rupture.....1".25 from neck  
 Character of broken surface.....fine silky, having serrations radiating from the center  
 Elongation of inch sections.....".27", ".14

No. 3955.

Marks,  $C_T$ ,  
 $L_1$ 

Diameters: End, ".5053; middle, ".5049; end, ".5053.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	-----	
2,000	10,000	.000300	.000200	-----	-----	
3,000	15,000	.000450	.000150	-----	-----	
4,000	20,000	.000600	.000150	0.	-----	
5,000	25,000	.000800	.000200	-----	-----	
6,000	30,000	.001000	.000200	-----	-----	
7,000	35,000	.001150	.000150	-----	-----	
8,000	40,000	.001350	.000200	.000050	.000050	
9,000	45,000	.001500	.000150	-----	-----	
10,000	50,000	.001650	.000150	-----	-----	
11,000	55,000	.001850	.000200	-----	-----	
12,000	60,000	.002000	.000150	.000050	0.	
13,000	65,000	.002200	.000200	-----	-----	Elastic limit.
14,000	70,000	.002400	.000200	-----	-----	
14,200	71,000	.002450	.000050	-----	-----	
14,400	72,000	.004500	.002050	-----	-----	
14,600	73,000	.006650	.002150	-----	-----	
14,800	74,000	.007000	.000350	-----	-----	
15,200	76,000	.008650	.001650	-----	-----	
15,600	78,000	.010000	.001350	-----	-----	
16,000	80,000	.011100	.001100	-----	-----	
16,400	82,000	.012700	.001600	-----	-----	
16,800	84,000	.014150	.001350	-----	-----	
17,200	86,000	.015350	.001200	-----	-----	
17,600	88,000	.017000	.001650	-----	-----	
18,000	90,000	.018650	.001650	-----	-----	Tensile strength. At time of fracture.
18,400	92,000	.020250	.001600	-----	-----	
18,800	94,000	.022100	.001850	-----	-----	
19,200	96,000	.023900	.001800	-----	-----	
19,600	98,000	.025700	.001800	-----	-----	
20,000	100,000	.028150	.002450	-----	-----	
20,400	102,000	.030250	.002100	-----	-----	
20,800	104,000	.032650	.002400	-----	-----	
21,200	106,000	.035550	.002900	-----	-----	
21,600	108,000	.040000	.004450	-----	-----	
22,000	110,000	.042250	.002250	-----	-----	
22,800	114,000	.0500	.007750	-----	-----	
23,600	118,000	.0700	.0200	-----	-----	
24,360	121,800	.1200	.0500	-----	-----	
20,900	-----	-----	-----	-----	-----	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 121,800  
 Elastic limit per square inch of original section ..... do... 71,000  
 Elongation per inch after rupture ..... inch... .2050  
 Elongation per inch under strain at elastic limit ..... do... .002450  
 Reduction in diameter at point of rupture ..... do... .115  
 Reduction in area after rupture, per centum of original section ..... 40.3  
 Position of rupture ..... at middle of stem  
 Character of broken surface ..... fine granular, radiating from a silky spot at circumference  
 Elongation of inch sections ..... ".25", ".16

No. 3956.

Marks, C T,  
L<sub>s</sub>

Diameters: End, ".5654; middle, ".5644; end, ".5655.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	0.	
2,500	10,000	.000387	.000200	.....	.....	
3,750	15,000	.000533	.000166	.....	.....	
5,000	20,000	.000733	.000200	0.	.....	
6,250	25,000	.000900	.000167	.....	.....	
7,500	30,000	.001100	.000200	.....	.....	
8,750	35,000	.001267	.000167	.....	.....	
10,000	40,000	.001433	.000166	.000033	.000033	
11,250	45,000	.001600	.000167	.....	.....	
12,500	50,000	.001767	.000167	.....	.....	
13,750	55,000	.001933	.000166	.....	.....	
15,000	60,000	.002100	.000167	.....	.....	
16,250	65,000	.002233	.000133	.....	.....	
16,500	66,000	.002267	.000034	.....	.....	Elastic limit.
16,750	67,000	.002300	.000033	.....	.....	
17,000	68,000	.002333	.000033	.....	.....	
17,250	69,000	.002367	.000034	.....	.....	
17,500	70,000	.002400	.000033	.....	.....	
17,750	71,000	.002433	.000033	.....	.....	
18,000	72,000	.002500	.000067	.....	.....	
18,250	73,000	.006300	.000038	.....	.....	
18,500	74,000	.006933	.000633	.....	.....	
19,000	76,000	.008267	.001334	.....	.....	
19,500	78,000	.009733	.001466	.....	.....	
20,000	80,000	.010667	.000934	.....	.....	
20,500	82,000	.012167	.001500	.....	.....	
21,000	84,000	.013667	.001500	.....	.....	
21,500	86,000	.014867	.001200	.....	.....	
22,000	88,000	.016433	.001566	.....	.....	
22,500	90,000	.018000	.001567	.....	.....	
23,000	92,000	.019533	.001533	.....	.....	
23,500	94,000	.021267	.001734	.....	.....	
24,000	95,000	.023100	.001833	.....	.....	
24,500	98,000	.025467	.002367	.....	.....	
25,000	100,000	.027200	.001733	.....	.....	
25,500	102,000	.029300	.002100	.....	.....	
26,000	104,000	.032167	.002867	.....	.....	
26,500	106,000	.035167	.003600	.....	.....	
27,000	108,000	.038000	.002833	.....	.....	
27,500	110,000	.042167	.004167	.....	.....	
28,500	114,000	.0567	.014533	.....	.....	
29,500	118,000	.0667	.0100	.....	.....	
30,310	121,240	.1200	.0533	.....	.....	
25,900	.....	.....	.....	.....	.....	Tensile strength. At time of fracture.

*General summary.*

Tensile strength per square inch of original section .....	pounds..	121,240
Elastic limit per square inch of original section .....	do.	72,000
Elongation per inch after rupture .....	inch..	.1733
Elongation per inch under strain at elastic limit .....	do.	.002500
Reduction in diameter at point of rupture .....	do.	.134
Reduction in area after rupture, per centum of original section .....	do.	41.9
Position of rupture .....	.....	at middle of stem
Character of broken surface .....	.....	silky, trace of granulation; serrations radiating from center of bar
Elongation of inch sections .....	.....	".10, ".33, ".09

No. 3957.

Marks,  $C_{L_3}^T$ 

Diameters: End, ".5642; middle, ".5642+; end, ".5642.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000267	.000167	.....	.....	
3,750	15,000	.000433	.000166	.....	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000800	.000200	.....	.....	
7,500	30,000	.000967	.000167	.....	.....	
8,750	35,000	.001167	.000200	.....	.....	
10,000	40,000	.001300	.000133	0.	.....	
11,250	45,000	.001500	.000200	.....	.....	
12,500	50,000	.001667	.000167	.....	.....	
13,750	55,000	.001833	.000166	.....	.....	
15,000	60,000	.002000	.000167	.....	.....	
16,250	65,000	.002200	.000200	.....	.....	
16,500	66,000	.002267	.000067	.....	.....	
16,750	67,000	.002300	.000033	.....	.....	
17,000	68,000	.002333	.000033	.....	.....	
17,250	69,000	.002367	.000034	.....	.....	
17,500	70,000	.002400	.000033	.....	.....	Elastic limit.
17,750	71,000	.006000	.003600	.....	.....	
18,000	72,000	.007233	.001233	.....	.....	
18,500	74,000	.008500	.001267	.....	.....	
19,000	76,000	.009767	.001267	.....	.....	
19,500	78,000	.011167	.001400	.....	.....	
20,000	80,000	.013333	.001666	.....	.....	
20,500	82,000	.014200	.001367	.....	.....	
21,000	84,000	.015600	.001400	.....	.....	
21,500	86,000	.017367	.001767	.....	.....	
22,000	88,000	.018633	.001266	.....	.....	
22,500	90,000	.020833	.002200	.....	.....	
23,000	92,000	.022333	.001500	.....	.....	
23,500	94,000	.024600	.002267	.....	.....	
24,000	96,000	.026267	.001667	.....	.....	
24,500	98,000	.029000	.002733	.....	.....	
25,000	100,000	.031833	.002833	.....	.....	
25,500	102,000	.034167	.002334	.....	.....	
26,000	104,000	.037500	.003333	.....	.....	
26,500	106,000	.040933	.004333	.....	.....	
27,000	108,000	.045833	.004900	.....	.....	
27,500	110,000	.051333	.005500	.....	.....	
28,000	114,000	.0667	.015367	.....	.....	
28,500	118,000	.1000	.0333	.....	.....	
29,510	118,040	.1200	.0200	.....	.....	Tensile strength.
25,300	.....	.....	.....	.....	.....	At time of fracture.

## General summary.

Tensile strength per square inch of original section ..... pounds.. 118,040  
 Elastic limit per square inch of original section ..... do... 70,000  
 Elongation per inch after rupture ..... inch.. .1800  
 Elongation per inch under strain at elastic limit ..... do... .002400  
 Reduction in diameter at point of rupture ..... do... .144  
 Reduction in area after rupture, per centum of original section ..... 44.6  
 Position of rupture ..... 1/10 from neck  
 Character of broken surface ..... silky, trace of granulation, serrations radiate from center of bar  
 Elongation of inch sections ..... ".27, ".17, ".10

TABULATION OF SPECIMENS TAKEN FROM BARS FURNISHED BY BETHLEHEM IRON COMPANY.

No. of test.	Marks.	Diameter. Inch.	Sec- tional area. Sq. inch.	Elastic limit per square inch. Pounds.	Tensile strength per square inch. Pounds.	Elongation in 2, 3, and 4 inches.		Con- traction of area. Per ct.	Appearance of fracture.	Elongation of inch sections.		
						Inch.	Per ct.			"	"	"
3844	CT <sub>1</sub> L <sub>2</sub>	.5046	.20	43,000	81,950	.61	30.5	49.1	Fine silky	.41*	.20	
3845	CT <sub>1</sub> L <sub>4</sub>	.5046	.20	46,000	82,100	.60	30.0	49.1	do	.29*	.31*	
3846	CT <sub>1</sub> L <sub>6</sub>	.5045	.25	46,000	81,600	.80	26.7	54.6	do	.16,	.46*	.18
3847	CT <sub>1</sub> L <sub>8</sub>	.5042	.25	44,000	82,040	.83	27.7	52.2	do	.13,	.47*,	.17
3848	CT <sub>2</sub> L <sub>2</sub>	.5047	.20	54,000	89,150	.57	28.5	59.8	do	.27*	.30*	
3849	CT <sub>2</sub> L <sub>4</sub>	.5049	.20	52,000	88,600	.56	28.0	57.2	do	.35*,	.21	
3850	CT <sub>2</sub> L <sub>6</sub>	.5042	.25	52,000	89,280	.72	24.0	59.3	do	.29*,	.30*	.13
3851	CT <sub>2</sub> L <sub>8</sub>	.5042	.25	51,000	88,840	.74	24.7	59.3	do	.13,	.42*	.19
3852	CT <sub>2</sub> L <sub>10</sub>	.5430	.237	52,000	88,230	.92	23.0	59.4	do	.13,	.37*	.30,
3853	CT <sub>2</sub> L <sub>12</sub>	.5436	.237	54,000	90,000	.87	21.8	59.4	do	.11,	.20,	.43*,
3854	CT <sub>3</sub> L <sub>2</sub>	.5046+	.20	77,000	122,050	.41	20.5	46.2	do	.27*,	.14	
3855	CT <sub>3</sub> L <sub>4</sub>	.5049	.20	71,000	121,800	.41	20.5	40.3	Fine granular, radiating from a silky spot at the circumference.	.25*,	.16	
3856	CT <sub>3</sub> L <sub>6</sub>	.5044	.25	72,000	121,240	.52	17.3	41.9	Silky, trace of granulation. Serrations radiating from center of bar.	.10,	.33*,	.09
3857	CT <sub>3</sub> L <sub>8</sub>	.5042	.25	70,000	118,040	.54	18.0	44.6	do	.27*,	.17,	.10



---

---

STEEL SPECIMENS

FROM

BETHLEHEM IRON COMPANY.

Tests made for comparison of testing machines.

---

---





No. 4226.

Mark, 1.

Diameter, ".560.

Sectional area, .246 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	Initial load.
0	0	0.	0.	0.	0.	
5,000	.....	.000625	.000625	.....	.....	
5,250	.....	.000650	.000625	.....	.....	
5,500	.....	.000675	.000625	.....	.....	
5,750	.....	.000700	.000625	.....	.....	
6,000	.....	.000750	.000650	.....	.....	
7,000	.....	.000900	.000650	.....	.....	
8,000	.....	.001025	.000625	.....	.....	
9,000	.....	.001175	.000650	.....	.....	
10,000	.....	.001300	.000625	.....	.....	
11,000	.....	.001425	.000625	.....	.....	
12,000	.....	.001550	.000625	.....	.....	
13,000	.....	.001675	.000625	.....	.....	
14,000	.....	.001825	.000650	.....	.....	
15,000	.....	.001950	.000625	.....	.....	
16,000	.....	.002075	.000625	.....	.....	
17,000	.....	.002250	.000675	.....	.....	
18,000	.....	.002400	.000650	.....	.....	
19,000	.....	.002525	.000625	.....	.....	
20,000	.....	.002700	.000675	0.	.....	
20,250	.....	.002725	.000625	.....	.....	
20,500	.....	.00270	.000625	.....	.....	
20,750	.....	.002775	.000625	.....	.....	
21,000	.....	.002800	.000625	.....	.....	
22,000	.....	.002950	.000650	0.	.....	
25,000	.....	.003400	.000450	.....	.....	
25,500	.....	.003450	.000650	.....	.....	
26,000	.....	.003525	.000675	.....	.....	
26,500	.....	.003575	.000650	.....	.....	
27,000	.....	.003675	.000650	.....	.....	
27,500	.....	.003750	.000675	.....	.....	
28,000	.....	.003825	.000675	.....	.....	
28,500	.....	.003925	.000650	.....	.....	
29,000	.....	.004025	.000650	.....	.....	
29,500	119,920	.004175	.000650	.....	.....	Elastic limit.
30,000	.....	.006100	.001925	.....	.....	
30,500	.....	.011625	.005525	.....	.....	
31,000	.....	.016500	.004875	.....	.....	
31,500	.....	.021750	.005250	.....	.....	Tensile strength.
32,000	.....	.031125	.009375	.....	.....	
32,770	133,210	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 133,210  
 Elastic limit per square inch of original section ..... do... 119,920  
 Elongation per inch after rupture ..... inch... .1100  
 Elongation per inch under strain at elastic limit ..... do... .004175  
 Reduction in diameter at point of rupture ..... do... .204  
 Reduction in area after rupture, per centum of original section ..... 59.3  
 Position of rupture ..... 1".5 from neck  
 Character of broken surface ..... fine silky, serrated circumference; radial cracks, 12 in number, penetrate from the circumference about half way to the center of the specimen.  
 Elongation of inch sections ..... ".02, ".05, ".30, ".07

No. 4227.

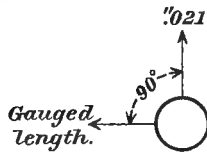
Mark, 2.

Diameter, ".5615.

Sectional area, .248 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
0	0	0.	0.	0.	0.	
5,000	.....	.000650	.000650	0.	.....	
5,250	.....	.000700	.000650	.....	.....	
5,500	.....	.000725	.000625	.....	.....	
5,750	.....	.000750	.000625	.....	.....	
6,000	.....	.000775	.000625	.....	.....	
7,000	.....	.000950	.000175	.....	.....	
8,000	.....	.001075	.000125	.....	.....	
9,000	.....	.001225	.000150	.....	.....	
10,000	.....	.001350	.000125	.....	.....	
11,000	.....	.001500	.000150	.....	.....	
12,000	.....	.001625	.000125	.....	.....	
13,000	.....	.001750	.000125	.....	.....	
14,000	.....	.001925	.000175	.....	.....	
15,000	.....	.002025	.000100	.....	.....	
16,000	.....	.002200	.000175	.....	.....	
17,000	.....	.002350	.000150	.....	.....	
18,000	.....	.002500	.000150	.....	.....	
19,000	.....	.002650	.000150	.....	.....	
20,000	.....	.002775	.000125	0.	.....	
20,250	.....	.002800	.000025	.....	.....	
20,500	.....	.002825	.000025	.....	.....	
20,750	.....	.002875	.000050	.....	.....	
21,000	.....	.002900	.000025	.....	.....	
22,000	.....	.003025	.000125	0.	.....	



Specimen runs out ".021 when run on centers; maximum concavity 90° from gauged length.

No. 4228.

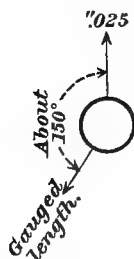
Mark, 3.

Diameter, ".563.

Sectional area, .249 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
0	0.	0.	0.	0.	0.	
5,000	.....	.000750	.000750	C.	.....	
5,250	.....	.000800	.000050	.....	.....	
5,500	.....	.000825	.000025	.....	.....	
5,750	.....	.000875	.000050	.....	.....	
6,000	.....	.000925	.000050	.....	.....	
7,000	.....	.001075	.000150	.....	.....	
8,000	.....	.001225	.000150	.....	.....	
9,000	.....	.001350	.000125	.....	.....	
10,000	.....	.001500	.000150	.....	.....	
11,000	.....	.001650	.000150	.....	.....	
12,000	.....	.001775	.000125	.....	.....	
13,000	.....	.001925	.000150	.....	.....	
14,000	.....	.002050	.000125	.....	.....	
15,000	.....	.002200	.000150	.....	.....	
16,000	.....	.002325	.000125	.....	.....	
17,000	.....	.002500	.000175	.....	.....	
18,000	.....	.002675	.000175	.....	.....	
19,000	.....	.002800	.000125	.....	.....	
20,000	.....	.002950	.000150	.000050	.000050	
20,250	.....	.003000	.000050	.....	.....	
20,500	.....	.003025	.000025	.....	.....	
20,750	.....	.003050	.000025	.....	.....	
21,000	.....	.003100	.000050	.....	.....	
22,000	.....	.003275	.000175	0.	.....	



Specimen runs out ".025, about 150° from line of gauged length.

No. 4229.

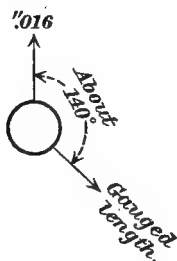
Mark, 4.

Diameter, ".5615.

Sectional area, .248 square inch.

Gauged length, 4".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
0	0	0.	0.	0.	0.	
5,000	.....	.000675	.000675	0.	.....	
5,250	.....	.000700	.000025	.....	.....	
5,500	.....	.000725	.000025	.....	.....	
5,750	.....	.000750	.000025	.....	.....	
6,000	.....	.000800	.000050	.....	.....	
7,000	.....	.000950	.000150	.....	.....	
8,000	.....	.001075	.000125	.....	.....	
9,000	.....	.001200	.000125	.....	.....	
10,000	.....	.001325	.000125	.....	.....	
11,000	.....	.001475	.000150	.....	.....	
12,000	.....	.001625	.000150	.....	.....	
13,000	.....	.001775	.000150	.....	.....	
14,000	.....	.001925	.000150	.....	.....	
15,000	.....	.002050	.000125	.....	.....	
16,000	.....	.002200	.000150	.....	.....	
17,000	.....	.002375	.000175	.....	.....	
18,000	.....	.002525	.000150	.....	.....	
19,000	.....	.002650	.000125	.....	.....	
20,000	.....	.002775	.000125	0.	.....	
20,250	.....	.002800	.000025	.....	.....	
20,500	.....	.002825	.000025	.....	.....	
20,750	.....	.002875	.000050	.....	.....	
21,000	.....	.002925	.000050	.....	.....	
22,000	.....	.003050	.000125	0.	.....	



Specimen runs out ".016, about 140° from line of gauged length.

---

---

## STEEL FOR FIXTURES FOR HYDROSTATIC TESTS OF SECTION OF 8-INCH TUBE.

Specimens from rings A and B, representing metal in packing glands; also from piston, for straining cylinder.

---

---



## RING A.

No. 3986.

Marks, <sup>Ring A</sup><sub>T<sub>1</sub>O</sub>  
 Diameter, ".564.  
 Sectional area, .25 square inch.  
 Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000687	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001167	.000167	0.	.....	Elastic limit.
9,500	38,000	.001300	.000133	.....	.....	
9,750	39,000	.001367	.000187	.....	.....	
10,000	40,000	.013500	.010333	.....	.....	
10,250	41,000	.014000	.000500	.....	.....	
10,500	42,000	.014933	.000933	.....	.....	
10,750	43,000	.015867	.000934	.....	.....	
11,000	44,000	.017167	.001300	.....	.....	
11,500	46,000	.019833	.002666	.....	.....	
12,000	48,000	.022600	.002767	.....	.....	
12,500	50,000	.025667	.003067	.....	.....	
13,000	52,000	.03167	.006003	.....	.....	
13,500	54,000	.0333	.00163	.....	.....	
14,000	56,000	.0367	.0034	.....	.....	
14,500	58,000	.0417	.0050	.....	.....	
15,000	60,000	.0500	.0083	.....	.....	
15,500	62,000	.0567	.0067	.....	.....	
16,000	64,000	.0617	.0050	.....	.....	
16,500	66,000	.0683	.0066	.....	.....	
17,000	68,000	.0833	.0150	.....	.....	
17,500	70,000	.1000	.0167	.....	.....	
18,000	72,000	.1267	.0267	.....	.....	Tensile strength.
18,420	73,680	.2133	.0866	.....	.....	

## General summary.

Tensile strength per square inch of original section ..... pounds.. 73,680  
 Elastic limit per square inch of original section ..... do... 38,000  
 Elongation per inch after rupture ..... inch... .2933  
 Elongation per inch under strain at elastic limit ..... do... .001300  
 Reduction in diameter at point of rupture ..... do... .194  
 Reduction in area after rupture, per centum of original section ..... 57.0  
 Position of rupture ..... 1'.30 from neck  
 Character of broken surface ..... fine silky  
 Elongation of inch sections ..... ".41", ".30", ".17

No. 3987.

Marks, <sup>Ring A</sup><sub>T<sub>2</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	.....	.....	
5,000	20,000	.000700	.000367	.....	.....	
7,500	30,000	.001033	.000333	.....	.....	
8,750	35,000	.001200	.000167	0.	.....	Elastic limit.
9,000	36,000	.001233	.000033	.....	.....	
9,250	37,000	.012667	.011434	.....	.....	
9,500	38,000	.013333	.000666	.....	.....	
9,750	39,000	.014000	.000667	.....	.....	
10,000	40,000	.015167	.001167	.....	.....	
10,500	42,000	.017333	.002166	.....	.....	
11,000	44,000	.019733	.002400	.....	.....	
11,500	46,000	.022400	.002667	.....	.....	
12,000	48,000	.025167	.002767	.....	.....	
12,500	50,000	.027833	.002666	.....	.....	
13,000	52,000	.032000	.004167	.....	.....	
13,500	54,000	.035667	.003667	.....	.....	
14,000	56,000	.039667	.004000	.....	.....	
14,500	58,000	.044667	.005000	.....	.....	
15,000	60,000	.0533	.008633	.....	.....	Tensile strength.
15,500	62,000	.0617	.0084	.....	.....	
16,000	64,000	.0667	.0050	.....	.....	
16,500	66,000	.0733	.0066	.....	.....	
17,000	68,000	.0900	.0167	.....	.....	
17,500	70,000	.1067	.0167	.....	.....	
18,000	72,000	.1400	.0333	.....	.....	
18,370	73,480	.2233	.0833	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds ..	73,480
Elastic limit per square inch of original section .....	do ..	36,000
Elongation per inch after rupture .....	inch ..	.3000
Elongation per inch under strain at elastic limit .....	do ..	.001233
Reduction in diameter at point of rupture .....	do ..	.184
Reduction in area after rupture, per centum of original section .....		54.6
Position of rupture .....	1".60 from neck	
Character of broken surface .....	fine silky	
Elongation of inch sections .....	".24, ".47*, ".19	



No. 4051.

Marks, <sup>Ring A</sup><sub>T<sub>2</sub>O</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	.....	.....	
5,000	20,000	.000700	.000567	.....	.....	
6,250	25,000	.000867	.000167	.....	.....	
7,500	30,000	.001033	.000166	0.	.....	
8,750	35,000	.001167	.000134	.....	.....	
10,000	40,000	.001400	.000233	0.	.....	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001467	.000034	.....	.....	
10,750	43,000	.001500	.000033	.....	.....	
11,000	44,000	.001500	0.	.....	.....	Elastic limit.
11,250	45,000	.001567	.000067	.....	.....	
11,500	46,000	.001700	.000133	.....	.....	
11,750	47,000	.001767	.000067	.....	.....	
12,000	48,000	.001900	.000133	.....	.....	
12,250	49,000	.002133	.000233	.....	.....	
12,500	50,000	.003233	.001100	.....	.....	
13,000	52,000	.006.67	.003334	.....	.....	
13,500	54,000	.008567	.002000	.....	.....	
14,000	56,000	.010433	.001866	.....	.....	
14,500	58,000	.012667	.002234	.....	.....	
15,000	60,000	.014833	.002166	.....	.....	
15,500	62,000	.017067	.002234	.....	.....	
16,000	64,000	.019667	.002600	.....	.....	
16,500	66,000	.022333	.002666	.....	.....	
17,000	68,000	.025167	.002834	.....	.....	
17,500	70,000	.028333	.003166	.....	.....	Tensile strength.
18,000	72,000	.032000	.003667	.....	.....	
18,500	74,000	.0367	.0047	.....	.....	
19,000	76,000	.0433	.0066	.....	.....	
19,500	78,000	.0467	.0034	.....	.....	
20,000	80,000	.0567	.0100	.....	.....	
20,500	82,000	.0667	.0100	.....	.....	
21,000	84,000	.0800	.0133	.....	.....	
21,500	86,000	.1333	.0533	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	86,000
Elastic limit per square inch of original section .....	do ..	47,000
Elongation per inch after rupture .....	inch..	.2333
Elongation per inch under strain at elastic limit .....	do ..	.001767
Reduction in diameter at point of rupture .....	do ..	.184
Reduction in area after rupture, per centum of original section .....		54.6
Position of rupture .....	1".50 from neck	
Character of broken surface .....	fine silky	
Elongation of inch sections .....	"21, "35, "14	

No. 4052.

Mark, <sup>Ring A</sup><sub>T<sub>1</sub>M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000133	.000133	0.	0.	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000700	.000367	.....	.....	
6,250	25,000	.000900	.000200	.....	.....	
7,500	30,000	.001100	.000200	.000033	.000033	
8,750	35,000	.001267	.000167	.....	.....	
10,000	40,000	.001433	.000166	.000067	.000034	
10,250	41,000	.001467	.000034	.....	.....	
10,500	42,000	.001533	.000066	.....	.....	Elastic limit.
10,750	43,000	.001567	.000034	.....	.....	
11,000	44,000	.001600	.000033	.....	.....	
11,250	45,000	.001633	.000033	.....	.....	
11,500	46,000	.001700	.000067	.....	.....	
11,750	47,000	.001933	.000233	.....	.....	
12,000	48,000	.002767	.000834	.....	.....	
12,250	49,000	.003267	.000500	.....	.....	
12,500	50,000	.004100	.000833	.....	.....	
13,000	52,000	.006500	.002400	.....	.....	
13,500	54,000	.008833	.002333	.....	.....	
14,000	56,000	.010667	.001834	.....	.....	
14,500	58,000	.012833	.002166	.....	.....	
15,000	60,000	.014667	.001834	.....	.....	
15,500	62,000	.016000	.002233	.....	.....	
16,000	64,000	.019167	.002267	.....	.....	Tensile strength.
16,500	66,000	.021733	.002566	.....	.....	
17,000	68,000	.024500	.002767	.....	.....	
17,500	70,000	.027500	.003000	.....	.....	
18,000	72,000	.031000	.003500	.....	.....	
18,500	74,000	.034833	.003833	.....	.....	
19,000	76,000	.039333	.004500	.....	.....	
19,500	78,000	.0433	.003967	.....	.....	
20,000	80,000	.0533	.0100	.....	.....	
20,500	82,000	.0600	.0067	.....	.....	
21,000	84,000	.0700	.0100	.....	.....	
21,500	86,000	.0967	.0267	.....	.....	
21,780	87,120	.1433	.0466	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	87,120
Elastic limit per square inch of original section .....	do..	46,000
Elongation per inch after rupture .....	inch..	.2233
Elongation per inch under strain at elastic limit .....	do..	.001700
Reduction in diameter at point of rupture .....	do..	.164
Reduction in area after rupture, per centum of original section .....	.....	49.7
Position of rupture .....	1".25 from neck	
Character of broken surface .....	fine silky	
Elongation of inch sections .....	"10, "23, "34"	

## RING B.

No. 4080.

Marks, Ring B  
T<sub>1</sub>O

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000733	.000400	.....	.....	
7,500	30,000	.001233	.000500	.....	.....	
8,750	35,000	.001400	.000187	.....	.....	
10,000	40,000	.001600	.000200	.000067	.000067	
10,500	42,000	.001633	.000033	.....	.....	
10,750	43,000	.001667	.000034	.....	.....	
11,000	44,000	.001700	.000033	.....	.....	
11,250	45,000	.001733	.000033	.....	.....	Elastic limit.
11,500	46,000	.001867	.000134	.....	.....	
11,750	47,000	.001933	.000066	.....	.....	
12,000	48,000	.002100	.000167	.....	.....	
12,250	49,000	.002433	.000333	.....	.....	
12,500	50,000	.003900	.001467	.....	.....	
13,000	52,000	.006700	.002800	.....	.....	
13,500	54,000	.008867	.002167	.....	.....	
14,000	56,000	.011000	.002133	.....	.....	
14,500	58,000	.013000	.002.....	.....	.....	
15,000	60,000	.014933	.001933	.....	.....	
15,500	62,000	.017100	.002167	.....	.....	
16,000	64,000	.019333	.002233	.....	.....	
16,500	66,000	.022000	.002667	.....	.....	
17,000	68,000	.024833	.002833	.....	.....	
17,500	70,000	.027500	.002667	.....	.....	
18,000	72,000	.030833	.003333	.....	.....	
18,500	74,000	.034667	.003834	.....	.....	
19,000	76,000	.038667	.004000	.....	.....	
19,500	78,000	.043567	.004900	.....	.....	
20,000	80,000	.050000	.006433	.....	.....	Tensile strength.
20,500	82,000	.060	.010	.....	.....	
21,000	84,000	.067	.007	.....	.....	
21,500	86,000	.090	.023	.....	.....	
21,890	87,560	.140	.050	.....	.....	

## General summary.

Tensile strength per square inch of original section.....	pounds..	87,560
Elastic limit per square inch of original section.....	do...	45,000
Elongation per inch after rupture.....	inch...	.2300
Elongation per inch under strain at elastic limit.....	do...	.001733
Reduction in diameter at point of rupture.....	do...	.184
Reduction in area after rupture, per centum of original section.....		54.6
Position of rupture.....	1".70 from neck	
Character of broken surface.....	fine silky	
Elongation of inch sections.....	"15, ".42, ".12	

No. 4081.

Marks, <sup>Ring B</sup><sub>T<sub>2</sub> M</sub>

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	0.	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
8,750	35,000	.001100	.000167	.....	.....	
10,000	40,000	.001267	.000167	0.	.....	
10,500	42,000	.001333	.000066	.....	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001433	.000066	.....	.....	Elastic limit.
11,250	45,000	.001567	.000134	.....	.....	
11,500	46,000	.001667	.000100	.....	.....	
11,750	47,000	.001933	.000266	.....	.....	
12,000	48,000	.002800	.000867	.....	.....	
12,250	49,000	.003600	.000800	.....	.....	
12,500	50,000	.004667	.001067	.....	.....	
13,000	52,000	.006667	.002000	.....	.....	
13,500	54,000	.008667	.002000	.....	.....	
14,000	56,000	.010567	.001900	.....	.....	
14,500	58,000	.012333	.001766	.....	.....	Tensile strength.
15,000	60,000	.014500	.002167	.....	.....	
15,500	62,000	.016700	.002200	.....	.....	
16,000	64,000	.019000	.002300	.....	.....	
16,500	66,000	.021167	.002167	.....	.....	
17,000	68,000	.023667	.002500	.....	.....	
17,500	70,000	.026667	.003000	.....	.....	
18,000	72,000	.029667	.003000	.....	.....	
18,500	74,000	.032900	.003233	.....	.....	
19,000	76,000	.036667	.003767	.....	.....	
19,500	78,000	.041500	.004833	.....	.....	
20,000	80,000	.047000	.005500	.....	.....	
20,500	82,000	.055833	.008833	.....	.....	
21,000	84,000	.060633	.004800	.....	.....	
21,500	86,000	.079167	.018534	.....	.....	
22,000	88,000	.110	.030833	.....	.....	
22,050	88,200	.133	.023	.....	.....	

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 88,200  
 Elastic limit per square inch of original section ..... do... 44,000  
 Elongation per inch after rupture ..... inch.. .2330  
 Elongation per inch under strain at elastic limit ..... do... .001433  
 Reduction in diameter at point of rupture ..... do... .164  
 Reduction in area after rupture, per centum of original section ..... 49.7  
 Position of rupture ..... at middle of stem  
 Character of broken surface ..... fine silky  
 Elongation of inch sections ..... ".13, ".42", ".15

## PISTON.

No. 4082.

Marks, Piston  
T<sub>1</sub> M

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000267	.000167	0.	0.	
5,000	20,000	.000600	.000333	0.	0.	
7,500	30,000	.000933	.000333	0.	0.	
8,750	35,000	.001067	.000134	0.	0.	
10,000	40,000	.001233	.000166	0.	0.	
11,250	45,000	.001400	.000167	0.	0.	
12,500	50,000	.001600	.000200	0.	0.	
12,750	51,000	.001633	.000033	0.	0.	
13,000	52,000	.001667	.000034	0.	0.	
13,250	53,000	.001700	.000033	0.	0.	
13,500	54,000	.001733	.000033	0.	0.	
13,750	55,000	.001767	.000034	0.	0.	Elastic limit.
14,000	56,000	.001933	.000166	0.	0.	
14,250	57,000	.002267	.000334	0.	0.	
14,500	58,000	.002933	.000666	0.	0.	
15,000	60,000	.005000	.002067	0.	0.	
15,500	62,000	.007167	.002167	0.	0.	
16,000	64,000	.008833	.001666	0.	0.	
16,500	66,000	.010667	.001834	0.	0.	
17,000	68,000	.012600	.001933	0.	0.	
17,500	70,000	.014600	.002000	0.	0.	
18,000	72,000	.016500	.001900	0.	0.	
18,500	74,000	.018833	.002333	0.	0.	
19,000	76,000	.020667	.001834	0.	0.	
19,500	78,000	.023033	.002366	0.	0.	
20,000	80,000	.025600	.002567	0.	0.	
20,500	82,000	.028500	.002900	0.	0.	
21,000	84,000	.031333	.002833	0.	0.	
21,500	86,000	.034833	.003500	0.	0.	
22,000	88,000	.038667	.003834	0.	0.	
22,500	90,000	.043333	.004666	0.	0.	
23,000	92,000	.049167	.00834	0.	0.	
23,500	94,000	.055833	.006666	0.	0.	
24,000	96,000	.0700	.014167	0.	0.	
24,500	98,000	.0867	.0167	0.	0.	
25,000	100,000	.1200	.0333	0.	0.	
25,010	100,040	.....	.....	.....	.....	Tensile strength.

## General summary.

Tensile strength per square inch of original section.....	pounds..	100,010
Elastic limit per square inch of original section.....	do..	53,000
Elongation per inch after rupture.....	inch..	.1933
Elongation per inch under strain at elastic limit.....	do..	.001767
Reduction in diameter at point of rupture.....	.....	.134
Reduction in area after rupture, per centum of original section.....	.....	41.9
Position of rupture.....	.....	1" from neck
Character of broken surface.....	.....	sifky
Elongation of inch sections.....	.....	".10, ".16, ".32*

No. 4083.

Marks,  $P_{10}$ ,  $T_1$ ,  $M$ Diameter,  $\frac{1}{2}$  inch.

Sectional area, .25 square inch.

Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	0.	
2,500	10,000	.000300	.000200			
5,000	20,000	.000633	.000333			
7,500	30,000	.000967	.000334			
8,750	35,000	.001133	.000166			
10,000	40,000	.001300	.000167			
11,250	45,000	.001400	.000100			
12,500	50,000	.001567	.000167			
12,750	51,000	.001630	.000033			
13,000	52,000	.001633	.000033			
13,250	53,000	.001667	.000034			
13,500	54,000	.001733	.000066			
13,750	55,000	.001800	.000067			
14,000	56,000	.001833	.000033			Elastic limit.
14,250	57,000	.001867	.000034			
14,500	58,000	.001933	.000066			
14,750	59,000	.002100	.000167			
15,000	60,000	.002433	.000333			
15,500	62,000	.003733	.001300			
16,000	64,000	.005867	.002134			
16,500	66,000	.008333	.002466			
17,000	68,000	.010400	.002067			
17,500	70,000	.012333	.001933			
18,000	72,000	.014667	.002334			
18,500	74,000	.016500	.001833			
19,000	76,000	.018667	.002167			
19,500	78,000	.021167	.002500			
20,000	80,000	.023500	.002333			Tensile strength.
20,500	82,000	.026167	.002667			
21,000	84,000	.029000	.002833			
21,500	86,000	.032333	.003333			
22,000	88,000	.036000	.003667			
22,500	90,000	.040000	.004000			
23,000	92,000	.045333	.005333			
23,500	94,000	.050833	.005500			
24,000	96,000	.059333	.008500			
24,500	98,000	.0720	.012667			
25,000	100,000	.1000	.0280			
25,040	100,160					

## General summary.

Tensile strength per square inch of original section	pounds..	100,160
Elastic limit per square inch of original section	do..	58,000
Elongation per inch after rupture	inch..	.1767
Elongation per inch under strain at elastic limit	do..	.001933
Reduction in diameter at point of rupture	do..	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture	"	.85 from neck
Character of broken surface		silky
Elongation of inch sections	"	.08, ".12, ".33*

---

---

SAMPLES FROM THREE PIECES OF STEEL

FROM

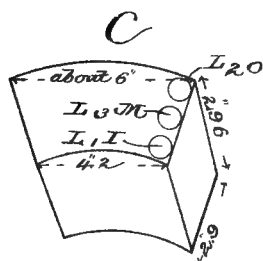
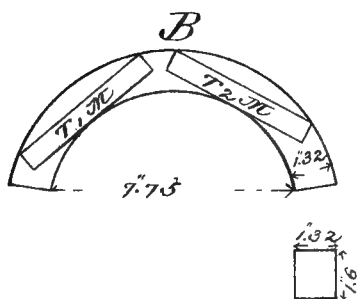
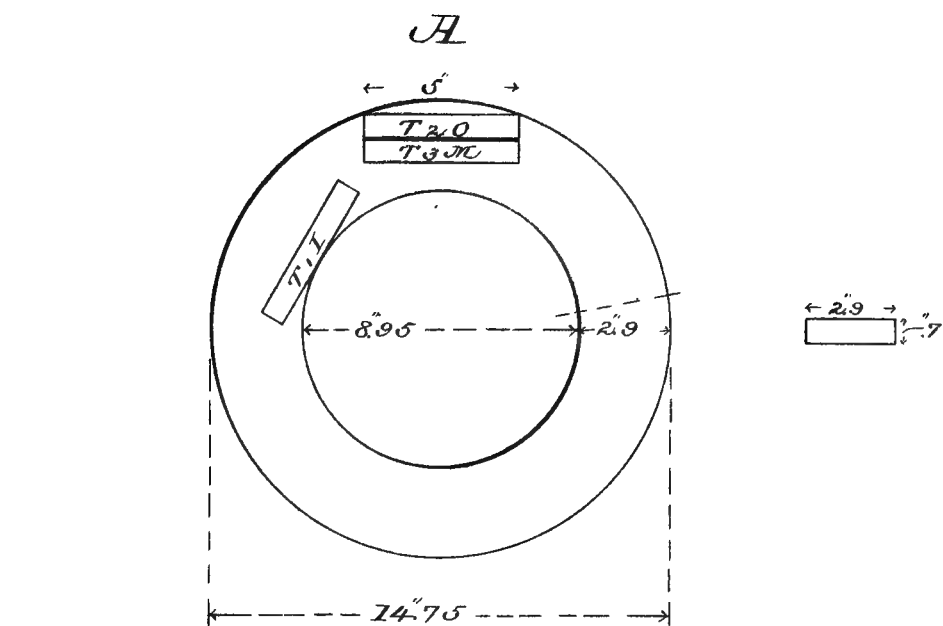
LOUIS GATHMAN, CHICAGO, ILL.

---

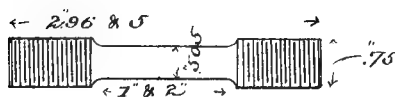
---







### Specimens





No. 4041.

Marks,  $T_1 I$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	.....	.....	
2,000	10,000	.000350	.000250	.....	.....	
3,000	15,000	.000500	.000150	.....	.....	
4,000	20,000	.000700	.000200	.....	.....	
5,000	25,000	.000900	.000200	.....	.....	
6,000	30,000	.001050	.000150	.000100	.000100	
6,200	31,000	.001100	.000050	.....	.....	
6,400	32,000	.001150	.000050	.....	.....	
6,600	33,000	.001250	.000100	.....	.....	Elastic limit.
6,800	34,000	.001400	.000150	.....	.....	
7,000	35,000	.001600	.000200	.....	.....	
7,200	36,000	.001800	.000200	.....	.....	
7,400	37,000	.002000	.000200	.....	.....	
7,600	38,000	.002450	.000450	.....	.....	
7,800	39,000	.002700	.000250	.....	.....	
8,000	40,000	.003200	.000500	.001650	.001550	
8,400	42,000	.003700	.000500	.....	.....	
8,800	44,000	.003950	.000250	.....	.....	
9,200	46,000	.005100	.001150	.....	.....	
9,600	48,000	.005900	.000800	.....	.....	
10,000	50,000	.006900	.001000	.....	.....	
10,400	52,000	.007750	.000850	.....	.....	
10,800	54,000	.008600	.000850	.....	.....	
11,200	56,000	.009400	.000800	.....	.....	
11,600	58,000	.010350	.000950	.....	.....	
12,000	60,000	.011200	.000850	.....	.....	
12,400	62,000	.012100	.000900	.....	.....	
12,800	64,000	.013000	.000900	.....	.....	
13,200	66,000	.014000	.001000	.....	.....	
13,600	68,000	.015150	.001150	.....	.....	
14,000	70,000	.016250	.001100	.....	.....	
14,400	72,000	.017550	.001300	.....	.....	
14,800	74,000	.018800	.001250	.....	.....	
15,200	76,000	.020000	.001200	.....	.....	
15,600	78,000	.020900	.000900	.....	.....	
16,000	80,000	.022400	.001500	.....	.....	
16,400	82,000	.023700	.001300	.....	.....	
16,800	84,000	.025500	.001800	.....	.....	
17,200	86,000	.026750	.001250	.....	.....	
17,600	88,000	.028250	.001500	.....	.....	
18,000	90,000	.030350	.002100	.....	.....	
18,400	92,000	.032000	.001650	.....	.....	
18,800	94,000	.034250	.002250	.....	.....	
19,200	96,000	.036250	.002000	.....	.....	
20,000	100,000	.040	.003750	.....	.....	
20,800	104,000	.045	.005	.....	.....	
21,600	108,000	.050	.005	.....	.....	
22,180	110,900	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 110,900  
 Elastic limit per square inch of original section ..... do.. 33,000  
 Elongation per inch after rupture ..... inch.. .005  
 Elongation per inch under strain at elastic limit ..... do.. .001250  
 Reduction in diameter at point of rupture ..... do.. .015  
 Reduction in area after rupture, per centum of original section ..... 5.7  
 Position of rupture ..... ".95 from neck  
 Character of broken surface ..... granular  
 Elongation of inch sections ..... ".09, ".04

No. 4042.

Marks,  $T_3O$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	.....	.....	
2,000	10,000	.000350	.000250	.....	.....	
3,000	15,000	.000500	.000150	.....	.....	
4,000	20,000	.000700	.000200	.....	.....	
5,000	25,000	.000850	.000150	.....	.....	
6,000	30,000	.001050	.000200	.000050	.000050	
6,200	31,000	.001150	.000100	.....	.....	
6,400	32,000	.001250	.000100	.....	.....	
6,600	33,000	.001350	.000100	.....	.....	
6,800	34,000	.001450	.000100	.....	.....	Elastic limit.
7,000	35,000	.001700	.000250	.....	.....	
7,200	36,000	.002000	.000300	.....	.....	
7,400	37,000	.002250	.000250	.....	.....	
7,600	38,000	.002500	.000250	.....	.....	
7,800	39,000	.002900	.000400	.....	.....	
8,000	40,000	.003400	.000500	.001900	.001850	
8,400	42,000	.004050	.000650	.....	.....	
8,800	44,000	.004900	.000850	.....	.....	
9,200	46,000	.005500	.000600	.....	.....	
9,600	48,000	.006500	.001000	.....	.....	
10,000	50,000	.007500	.001000	.....	.....	
10,400	52,000	.008200	.000700	.....	.....	
10,800	54,000	.009100	.000900	.....	.....	
11,200	56,000	.010000	.000900	.....	.....	
11,600	58,000	.010900	.000900	.....	.....	
12,000	60,000	.012000	.001100	.....	.....	
12,400	62,000	.012900	.000900	.....	.....	
12,800	64,000	.014000	.001100	.....	.....	
13,200	66,000	.015000	.001000	.....	.....	
13,600	68,000	.016000	.001000	.....	.....	
14,000	70,000	.017000	.001000	.....	.....	
14,400	72,000	.018350	.001350	.....	.....	
14,800	74,000	.019250	.000900	.....	.....	
15,200	76,000	.020900	.001750	.....	.....	
15,600	78,000	.021750	.000850	.....	.....	
16,000	80,000	.023500	.001750	.....	.....	
16,400	82,000	.024850	.001350	.....	.....	
16,800	84,000	.026350	.001500	.....	.....	
17,200	86,000	.027850	.001500	.....	.....	
17,600	88,000	.029500	.001650	.....	.....	
18,000	90,000	.031500	.002000	.....	.....	
18,400	92,000	.033500	.002000	.....	.....	
18,800	94,000	.036000	.002500	.....	.....	
19,200	96,000	.038750	.002750	.....	.....	
19,600	98,000	.041250	.002500	.....	.....	
20,000	100,000	.044300	.003050	.....	.....	Tensile strength.
22,040	110,200	.....	.....	.....	.....	

*General summary.*

Tensile strength per square inch of original section .....	pounds..	110,200
Elastic limit per square inch of original section .....	do...	34,000
Elongation per inch after rupture .....	in. h..	.070
Elongation per inch under strain at elastic limit .....	do...	.001450
Reduction in diameter at point of rupture .....	do...	.015
Reduction in area after rupture, per centum of original section .....	.....	5.7
Position of rupture .....	.....	".70 from neck
Character of broken surface .....	.....	granular
Elongation of inch sections .....	.....	".07", ".07

No. 4043.

Marks, T<sub>3</sub><sup>A</sup><sub>M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100			
2,000	10,000	.000350	.000250			
3,000	15,000	.000500	.000150			
4,000	20,000	.000800	.000100			
5,000	25,000	.000800	.000200			
6,000	30,000	.001100	.000300	.000050	.000050	
6,200	31,000	.001150	.000050			
6,400	32,000	.001200	.000050			
6,600	33,000	.001350	.000150			
6,800	34,000	.001450	.000100			Elastic limit.
7,000	35,000	.001600	.000150			
7,200	36,000	.001900	.000300			
7,400	37,000	.002150	.000250			
7,600	38,000	.002450	.000300			
7,800	39,000	.002850	.000400			
8,000	40,000	.003100	.000250	.001700	.001650	
8,400	42,000	.003900	.000800			
8,800	44,000	.004750	.000850			
9,200	46,000	.005600	.000850			
9,600	48,000	.006400	.000800			
10,000	50,000	.007400	.001000			
10,400	52,000	.008350	.000950			
10,800	54,000	.009000	.000550			
11,200	56,000	.009900	.000900			
11,600	58,000	.010850	.000950			
12,000	60,000	.012000	.001150			
12,400	62,000	.012900	.000900			
12,800	64,000	.013750	.000850			
13,200	66,000	.014800	.001150			
13,600	68,000	.016000	.001100			
14,000	70,000	.017000	.001000			
14,400	72,000	.018250	.001250			
14,800	74,000	.019400	.001150			
15,200	76,000	.020600	.001200			
15,600	78,000	.022000	.001400			
16,000	80,000	.023350	.001350			
16,400	82,000	.024900	.001550			
16,800	84,000	.026400	.001500			
17,200	86,000	.028350	.001950			
17,600	88,000	.029750	.001400			
18,000	90,000	.031500	.001750			
18,400	92,000	.033900	.002400			
18,800	94,000	.036300	.002400			
19,200	96,000	.038750	.002450			
19,600	98,000	.042000	.003250			
20,000	100,000	.045500	.003500			
21,520	107,600	-----	-----	-----	-----	Tensile strength.

## General summary.

Tensile strength per square inch of original section .....	pounds..	107,600
Elastic limit per square inch of original section .....	do..	35,000
Elongation per inch after rupture .....	inch..	.060
Elongation per inch under strain at elastic limit .....	do..	.001600
Reduction in diameter at point of rupture .....	do..	.015
Reduction in area after rupture, per centum of original section .....		5.7
Position of rupture .....	"	.60 from neck
Character of broken surface .....		granular
Elongation of inch sections .....	"	.06, ".06

No. 4044.

Marks,  $T_1^B M$ 

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	.....	.....	
2,000	10,000	.000250	.000150	.....	.....	
3,000	15,000	.000450	.000200	.....	.....	
4,000	20,000	.000600	.000150	.....	.....	
5,000	25,000	.000850	.000250	.....	.....	
6,000	30,000	.001050	.000200	0.	.....	
6,200	31,000	.001100	.000050	.....	.....	
6,400	32,000	.001150	.000050	.....	.....	
6,600	33,000	.001200	.000050	.....	.....	
6,800	34,000	.001250	.000050	.....	.....	
7,000	35,000	.001350	.000100	.....	.....	
7,200	36,000	.001400	.000050	.....	.....	
7,400	37,000	.001450	.000050	.....	.....	
7,600	38,000	.001500	.000050	.....	.....	
7,800	39,000	.001550	.000050	.....	.....	
8,000	40,000	.001600	.000650	.000100	.000100	
8,200	41,000	.002000	.000400	.....	.....	
8,400	42,000	.003250	.001250	.....	.....	
8,600	43,000	.005400	.002150	.....	.....	
8,800	44,000	.006500	.001100	.....	.....	
9,000	45,000	.007400	.000900	.....	.....	
9,200	46,000	.008350	.000950	.....	.....	
9,400	47,000	.009400	.001050	.....	.....	
9,520	47,600	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section . . . . . pounds.. 47,600  
 Elastic limit per square inch of original section . . . . . do... 40,000  
 Elongation per inch after rupture . . . . . inch... .005  
 Elongation per inch under strain at elastic limit. . . . . do... .001600  
 Reduction in diameter at point of rupture . . . . . inappreciable  
 Position of rupture . . . . . ".45 from neck  
 Character of broken surface. . . . . 40 per cent. granular, 60 per cent. spongy. The spongy metal varied  
 in color from light blue to dull leaden color.

No. 4045.

Marks,  $T_B$ ,  $M$ Diameter,  $\frac{1}{2}$ ".505.

Sectional area, .20 square inch.

Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	.....	.....	
2,000	10,000	.000350	.000250	.....	.....	
3,000	15,000	.000500	.000150	.....	.....	
4,000	20,000	.000700	.000200	.....	.....	
5,000	25,000	.000850	.000150	.....	.....	
6,000	30,000	.001050	.000200	0.	.....	
6,200	31,000	.001050	0.	.....	.....	
6,400	32,000	.001100	.000050	.....	.....	
6,600	33,000	.001100	0.	.....	.....	
6,800	34,000	.001150	.000050	.....	.....	
7,000	35,000	.001200	.000050	.....	.....	
7,200	36,000	.001300	.000100	.....	.....	
7,400	37,000	.001350	.000050	.....	.....	
7,600	38,000	.001400	.000050	.....	.....	
7,800	39,000	.001550	.000150	.....	.....	
7,980	39,900	.....	.....	.....	.....	Tensile strength.

*General summary.*

Tensile strength per square inch of original section .....pounds. 39,900  
 Elongation per inch after rupture.....inappreciable  
 Reduction in diameter at point of rupture.....inappreciable  
 Position of rupture.....at neck  
 Character of broken surface.....granular, 30 per cent.; flaky and spongy, 70 per cent

Marks, <sup>C</sup><sub>L<sub>1</sub>I</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Length of stem, 1".

Tensile strength, 6,640 pounds = 33.200 pounds per square inch.

Fractured ".35 from neck. Appearance of fracture, granular; 30 per cent. of surface dull spongy.

Cylindrical surface of specimen showed spongy metal.

Marks, <sup>C</sup><sub>L<sub>2</sub>O</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Length of stem, 1".

Tensile strength, 5,160 pounds=25.800 pounds per square inch.

Fractured ".2 from neck. Appearance, granular, 30 per cent.; balance of fracture oblique across stem and had a dark-colored, spongy appearance.

Cylindrical surface of specimen showed spongy metal.

## No. 4046.

Marks, <sup>C</sup><sub>L<sub>3</sub>M</sub>

Diameter, ".505.

Sectional area, .20 square inch.

Gauged length, 1".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.
200	1,000	0.	0.	0.	0.	
1,000	5,000	.0001	.0001	.....	.....	
2,000	10,000	.0002	.0001	.....	.....	
3,000	15,000	.0002	0.	.....	.....	
4,000	20,000	.0004	.0002	.....	.....	Elastic limit, approxi- mate.
5,000	25,000	.0012	.0008	.....	.....	
6,000	30,000	.0021	.0009	.0005	.0005	
6,200	31,000	.0023	.0002	.....	.....	Tensile strength.
6,400	32,000	.0026	.0003	.....	.....	
6,600	33,000	.0033	.0007	.....	.....	

Fractured ".2 from neck. Appearance, dull granular, 40 per cent.; spongy, 60 per cent.

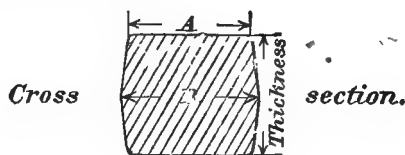


## STEEL FROM NATIONAL ARMORY.

No. of test.	Mark on speci- men.	Dimensions.		Elastic limit.		Ultimate strength.		Elongation in 7 inches.		Area at fracture.	Con- traction of area.	Appearance of fracture.	Elongation of 1-inch sections.
		Width.	Thick- ness.	Total.	Per square inch.	Total.	Per square inch.	Inches.	Per ct.				
3791	IR	1.503	.210	Pounds. 24,670	Pounds. 78,070	Pounds. 28,430	Pounds. 89,970	1.23	17.6	" Sq. in. 1.25 X .16=200	Per ct. 36.7	Fine silky trace of lamination at middle of thick- ness.	" " " " " " .12, .11, .17, .41*, .17, .13, .12
3792	IR	1.501	.212	24,020	75,530	27,580	87,990	1.29	18.4	1.26 X .16=202	36.5		12, 28, 32, 15, 15, 15, 12
3793	IW	1.502	.217	25,610	78,560	30,140	92,450	1.19	17.0	1.26 X .14=176	46.0		15, 42*, 18, 14, .11, 10, 09
3794	IW	1.502	.218	26,240	80,240	30,580	93,550	1.39	18.4	1.26 X .13=164	49.8		12, 40*, 22, 17, .13, .14, .11
3392	IR	.564	Diam...	14,510	58,040	22,420	89,680	.77	25.7	.40 diam.=128	49.6	Fine silky.	15, 36*, 36
3393	IR	.564	do	14,970	59,880	22,360	89,440	.69	23.0	.40 diam.=126	49.6	do	13, 37*, 19
3394	IW	.564	do	11,960	47,840	17,160	68,640	.87	29.0	.37 diam.=108	56.8	do	17, 48*, 22
3395	IW	.564	do	12,070	49,070	16,930	68,520	.88	29.3	.37 diam.=108	56.1	do	20, 49*, 19
3857	IW	.564	do	12,210	48,640	18,470	73,880	.57	28.5	.42 diam.=139	44.6	Fine silky.	* .29, 23

STRAINING OF COLD-ROLLED STAVES FOR WOODBRIDGE 10-INCH  
W. W. RIFLE.

Total length, 15 feet 6½ inches.



No. 3141.

Dimensions, { Thickness .... 3".150  
 A ..... 3".512  
 B ..... 3".578  
 Sectional area, "11.15 square inches.  
 Gauged length, 150".

Applied loads.		In gauged length.		Lateral contraction in 3".30.	Remarks.
Total.	Per square inch.	Elongation.	Set.		
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
10, 560	947	0.	0.	.....	Initial load.
105, 600	9, 470	.0160	0.	.....	
211, 200	18, 940	.0947	.0001	.....	
316, 800	28, 410	.1444	.0007	.....	
422, 400	37, 880	.1958	.0021	.....	
528, 000	47, 350	.2502	.0035	.....	
10, 560	947	.....	.....	0.	
105, 600	9, 470	.....	.....	.0003	
211, 200	18, 940	.....	.....	.0007	
316, 800	28, 410	.....	.....	.0010	
422, 400	37, 880	.....	.....	.0013	
528, 000	47, 350	.....	.....	.0016	
422, 400	37, 880	.....	.....	.0013	
316, 800	28, 410	.....	.....	.0010	
211, 200	18, 940	.....	.....	.0006	
105, 600	9, 470	.....	.....	.0002	
10, 560	947	.....	.....	.0000	
641, 390	57, 520	.....	.....	.....	Load released and bar rotated one half turn.
679, 119	60, 910	.....	.....	.....	Maximum stress applied.
0	0	.....	.035	.....	

NOTE.—The lateral contraction under tensile stress was measured by means of a micrometer mounted transversely or at right angles to the axis of the bar.

No. 3142.

Dimensions, { Thickness....3".164  
 { A .....3".40  
 { B .....3".49  
 Sectional area, 10.89 square inches.  
 Gauged length, 150".

Applied loads.		In gauged length.		Lateral contraction in 3".20.	Remarks.
Total.	Per square inch.	Elongation.	Set.		
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>		
10,900	1,001	0.	0.	.....	Initial load.
109,000	10,010	.0475	.0010	.....	
218,000	20,020	.0989	.0013	.....	
327,000	30,030	.1516	.0018	.....	
436,000	40,040	.2056	.0020	.....	
545,000	50,050	.2626		.....	
436,000	40,040	.2116		.....	
327,000	30,030	.1591		.....	
218,000	20,020	.1067		.....	
109,000	10,010	.0540	.0000	.....	
109,000	10,010	.0525		.....	
218,000	20,020	.1045		.....	
327,000	30,030	.1570		.....	
436,000	40,040	.2107		.....	
545,000	50,050	.2655		.....	
436,000	40,040	.2132		.....	
327,000	30,030	.1607		.....	
436,000	40,040	.2127		.....	
545,000	50,050	.2660		.....	
523,200	48,040	.2557		.....	
545,000	50,050	.2667		.....	Set micrometer with this load, which was an advancing one, then backed off micrometer ".002, and then backed off load 400 pounds, when there was contact of micrometer, showing the above clearance (".002) had been taken up.
523,200	48,040	.2566		.....	
436,000	40,040	.2146		.....	
327,000	30,030	.1622		.....	
350,000				.....	
218,000	20,020	.1094		.....	
109,000	10,010	.0565	.0081	.....	
109,000	10,010	.0549		.....	
218,000	20,020	.1070		.....	
327,000	30,030	.1599		.....	
218,000	20,020	.1080		.....	
109,000	10,010	.0560	.0081	.....	
10,900	1,001			0.	
109,000	10,010			.0003	
218,000	20,020			.0006	
327,000	30,030			.0009	
436,000	40,040			.0012	
545,000	50,050			.0015	
436,000	40,040			.0012	
327,000	30,030			.0009	
218,000	20,020			.0006	
109,000	10,010			.0002	
10,900	1,001			0	
679,119	62,360				Maximum stress applied.
0	0		.03		

Total load of 679,119 pounds applied to each stave.  
Deflections measured in length of 136".

No. of test.	Marks.	Dimensions.			Sectional area.	Loads applied, pounds.	Perman-ent set in 50".	Total deflection after straining.
		Width.		Thick-ness.				
		A.	B.					
		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Sq. inches.</i>	<i>Sq. inches.</i>	<i>Inch.</i>	<i>Inch.</i>
3157	3	3.46	3.61	3.15	11.12	61,070	.01	.....
3158	4	3.48	3.63	3.16	11.22	60,530	.00	.....
3159	5	3.40	3.54	3.15	10.92	62,190	.01	.....
3160	6	3.42	3.53	3.16	10.97	61,910	.01	.....
3161	7	3.43	3.63	3.15	11.11	61,130	.01	.....
3162	8	3.45	3.63	3.15	11.14	60,960	.01	.....
3163	9	3.45	3.61	3.13	11.04	61,510	.00	.....
3164	10	3.46	3.62	3.15	11.14	60,960	.01½	.....
3165	11	3.50	3.62	3.13	11.13	61,020	.01½	.15
3166	12	3.46	3.60	3.15	11.11	61,130	.01	.....
3167	13	3.42	3.54	3.16	10.98	61,850	.01	.10
3168	14	3.45	3.61	3.14	11.07	61,350	.01	.....
3169	15	3.50	3.53	3.16	11.09	61,240	.00	.08
3170	16	3.54	3.61	3.15	11.25	60,370	.00	.07
3171	17	3.45	3.57	3.14	11.01	61,680	.01	.....
3172	18	3.54	3.59	3.14	11.18	60,740	.01	.07
3173	19	3.50	3.59	3.14	11.12	61,070	.01	.10
3174	20	3.51	3.61	3.13	11.13	61,020	.01	.....
3175	21	3.54	3.61	3.14	11.21	60,580	.00	.08
3176	22	3.46	3.53	3.15	11.00	61,740	.01	.05
3177	23	3.45	3.61	3.15	11.11	61,130	.....	.05
3178	24	3.50	3.61	3.14	11.15	60,910	.00	.08
3179	25	3.53	3.62	3.15	11.25	60,370	.00	.06

The following staves were straightened in a screw press, and strained a second time with 679,119 pounds tension: Nos. 9, 11, 13, 15, 16, 18, 19, 21, and 24. This straining appeared to increase the permanent set of the following staves ".01 each in a gauged length of 50": Nos. 9, 11, 13, 15, 18, and 24. The other restrained staves showed no additional sets.

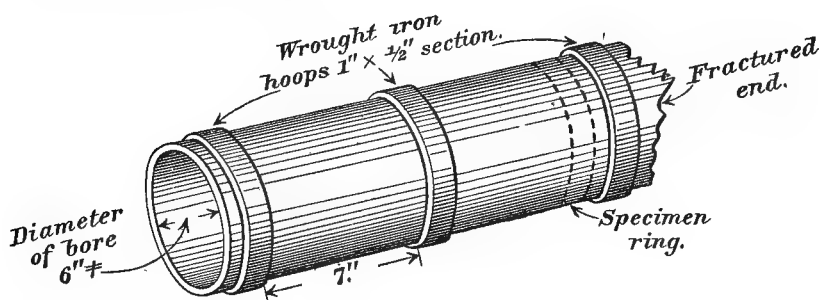
Stave No. 11 has deflection of ".10 after straightening and second application of stress of 679,119 pounds. It was restraightened in the screw press and afterward strained with 679,119 pounds tension. No further set appeared.

## PYROTECHNIC MORTAR BODY.

Tensile test of two samples cut from a fractured wrought-iron pyrotechnic mortar body which exploded July 4, 1839, at Salem, Mass.

The mortar body was made of a piece of gas pipe reinforced with hoops.

A ring  $1\frac{1}{2}$ " long was cut from the body near the fractured end, this ring was cut into two specimens, the specimens straightened hot and afterward tested by tension.



No. of test.	Dimensions.		Sectional area.	Tensile strength.		Fracture.
	Width.	Thickness.		Total.	Per square inch.	
	<i>Inches.</i>	<i>Inch.</i>	<i>Sq. inch.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
4273	1.558	.278	.433	18,820	43,460	Fibrous, lamellar. Fibrous, lamellar, 55 per cent. Oblique following scarf of lap weld in pipe, 45 per cent.
4274	1.555	.255	.396	16,940	42,780	

# **TENSILE TESTS OF CHAIN CABLE FOR INSPECTOR THIRD U. S. LIGHT-HOUSE DISTRICT.**

Samples consist of three studded links of chain with end links not studded.

## **No. 3875.**

Studs branded "W. N. Y."

Diameter of end links, 2".12.

Diameter of studded links, 2".

Sectional area of studded chain, 6.28 square inches.

Tensile strength, 183,200 pounds=29.170 pounds per square inch.

Fractured end link at weld. Followed the scarf in part; balance of fracture fibrous with granular metal at one side of fractured surface.

A second fracture occurred inside of link, which was granular throughout.

## **No. 3875a.**

A new end link provided and chain retested.

Tensile strength, 194,600 pounds=30.920 pounds per square inch.

Fractured outside studded link in the quarter and in the side. Both fractures were granular.

## **No. 3876.**

Diameter of end links  $\left\{ \begin{array}{l} 2''.14 \\ 1''.98 \end{array} \right.$

Diameter of studded links, 1''.82

Sectional area of studded chain, 5.20 square inches.

Tensile strength, 218,550 pounds=42.030 pounds per square inch.

Fractured first link of chain at weld; followed scarf in part, showing an unwelded dark-colored spot  $1'' \times 1\frac{1}{8}''$ ; balance of fracture fibrous.

---

---

# ENDURANCE OF ROTATING SHAFTS

OF

O. H. STEEL, WROUGHT-IRON, AND CAST-IRON.

---

---





## ENDURANCE TESTS OF ROTATING SHAFTS.—TESTS CONTINUED FROM REPORT OF 1889.

The experiments herewith reported were made chiefly with two kinds of metal: a mild grade of open-hearth steel, and a soft but tough wrought iron.

The specimens were turned down from hot-rolled rods  $1\frac{1}{4}$ " diameter, each of which was about 15 feet long.

The rods were marked numerically and specimens taken from them bear their distinguishing numbers.

The tests comprise bars ruptured under fiber stresses which were increased at intervals, beginning with loads below the elastic limit, rupture occurring after stresses had been reached which caused greater or less permanent sets.

The larger number of specimens, however, were subjected to special treatment, and observations on their behavior made at frequent intervals, carrying out the idea embodied in the tests of previous years, that is, giving prominence to the investigation and determination of observable changes in properties preceding ultimate rupture, as well as the effects of different treatment upon the ultimate endurance of the shafts under repeated alternate stresses.

It will be seen from the details of the tests that certain specimens were ruptured under a constant fiber stress, and others were annealed at different temperatures, and after different intervals of rotations; also that the test of certain bars which began at atmospheric temperature were allowed to acquire a higher temperature due the rapid alternation of stresses when exceeding the elastic limit, and some were maintained at a uniform low temperature by means of a stream of cold water flowing upon the experimental shaft at the middle bearing, and some bars were run at higher temperatures, either which they were allowed to acquire by the natural tendency to heat as above referred to, or were initially heated at the commencement and during the continuance of the test by means of gas-burners.

The speed of rotation was for most of the shafts kept at 400 turns per minute. A higher speed was employed, however, for a number of shafts than has heretofore been used in these investigations, namely, 2,200 rotations per minute.

It was, of course, at this higher speed that the greatest natural heating of the shafts occurred.

The opportunity afforded by this high rate of speed was utilized to extend the observations of the previous year on the relative deflection of the shaft under extremes of speed.

## TEST No. 31.

*O. H. Steel from Rod No. 1.*

The test of the shaft began under the maximum fiber stress of 20,000 pounds per square inch, which was continued by increments of 1,000 pounds per square inch after successive runs of 10,000 turns.

Slight permanent sets appeared under the earliest loads, but did not increase in amount until 40,000 pounds per square inch fiber stress was reached.

Under succeeding loads the sets increased, and with the increase of sets the shaft gradually acquired a higher temperature, which became painful to the touch just prior to rupture.

At the time of rupture the shaft was running under a load of 53,000 pounds per square inch, maximum fiber stress, and had made 330,410 rotations.

The tensile test of the specimen taken from the outer end of this shaft showed an apparent elastic limit of 58,000 pounds per square inch.

The rotating test was discontinued before the rupture of the shaft was completed. The fracture at the time had extended over 180 degrees of arc on the surface of the shaft, and had separated 45 per cent. of its sectional area. This section of rupture had a dull leaden hue, with a fairly smooth surface.

The balance of the fracture, after the shaft was broken transversely over the anvil, showed a fine granular appearance, but with several fine cracks extending below the cylindrical surface from ".03 to ".10, the sides of which were comparatively smooth, and were developed doubtless during the time the shaft was rotated under load.

## No. 31.—O. H. Steel Bar. Mark 1.

Diameter 1". Speed of rotation 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On time.	Unloaded.	Loaded.	Unloaded.			
20,000 Pounds.	0	0	<i>a</i>	<i>Inch.</i> .1993 .1990 .1992	<i>Inch.</i> .1846 .1847 .1846	<i>Inch.</i> .1992 .1992 .1992	<i>Inch.</i> .0146 .0145 .0146	<i>Inch.</i> .0001 — 0.	
	10,000	10,000	<i>a</i>	.1994	.1846	.1992	.0146	.0002	
			<i>b</i>	.1993	.1846	.1992	.0146	.0001	
			<i>c</i>	.1993	.1846	.1993	.0147	0.	
	0	10,000	<i>a</i>	.1993	.1838	.1992	.0154	.0001	
			<i>b</i>	.1993	.1838	.1992	.0154	.0001	
21,000	10,000	20,000	<i>a</i>	.1994	.1839	.1992	.0153	.0002	
			<i>b</i>	.1993	.1838	.1992	.0154	.0001	
			<i>c</i>	.1993	.1838	.1992	.0154	.0001	
	0	20,000	<i>a</i>	.1994	.1832	.1993	.0161	.0001	
			<i>b</i>	.1994	.1833	.1993	.0160	.0001	
			<i>c</i>	.1993	.1832	.1993	.0161	0.	
22,000	10,000	30,000	<i>a</i>	.1993	.1832	.1993	.0161	0.	
			<i>b</i>	.1994	.1832	.1993	.0161	.0001	
			<i>c</i>	.1994	.1831	.1993	.0162	.0001	
	0	30,000	<i>a</i>	.1994	.1824	.1993	.0169	.0001	
			<i>b</i>	.1994	.1824	.1993	.0169	.0001	
			<i>c</i>	.1994	.1824	.1993	.0169	.0001	
23,000	10,000	40,000	<i>a</i>	.1994	.1824	.1993	.0169	.0001	
			<i>b</i>	.1994	.1824	.1993	.0169	.0001	
			<i>c</i>	.1994	.1824	.1993	.0169	.0001	
	0	40,000	<i>a</i>	.1994	.1817	.1993	.0176	.0001	
			<i>b</i>	.1994	.1816	.1993	.0177	.0001	
			<i>c</i>	.1994	.1816	.1993	.0177	.0001	
24,000	0								

No. 31.—O. H. Steel Bar. Mark, 1—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.		
Pounds.			Inch.	Inch.	Inch.	Inch.	Inch.	
25,000	10,000	50,000	a . b . c .	.1992 .1994 .1994	.1816 .1816 .1815	.1992 .1992 .1992	.0176 .0002 .0002	
	0	50,000	a b c	.1994 .1994 .1994	.1808 .1808 .1808	.1992 .1992 .1992	.0184 .0002 .0002	
	10,000	60,000	a b c	.1993 .1994 .1994	.1808 .1808 .1808	.1992 .1992 .1992	.0184 .0002 .0002	
	0	60,000	a b c	.1994 .1994 .1994	.1802 .1802 .1802	.1992 .1993 .1993	.0190 .0191 .0191	
27,000	10,000	70,000	a b c	.1993 .1994 .1994	.1803 .1803 .1802	.1993 .1993 .1993	.0190 .0001 .0001	
	0	70,000	a b c	.1993 .1994 .1994	.1794 .1793 .1793	.1993 .1993 .1993	.0199 .0001 .0001	
	10,000	80,000	a b c	.1994 .1994 .1994	.1793 .1793 .1794	.1993 .1993 .1993	.0200 .0001 .0001	
	0	80,000	a b c	.1993 .1994 .1994	.1792 .1790 .1789	.1993 .1993 .1993	.0201 .0203 .0204	
28,000	10,000	90,000	a b c	.1993 .1994 .1994	.1792 .1791 .1789	.1993 .1993 .1993	.0201 .0202 .0204	
	0	90,000	a b c	.1994 .1994 .1994	.1784 .1786 .1784	.1993 .1993 .1992	.0209 .0207 .0208	

30,000	10,000	100,000	a	.1994	.1763	.1993	.0210	.0001
			b	.1994	.1784	.1993	.0209	.0001
	0	100,000	c	.1994	.1785	.1993	.0208	.0001
			a	.1994	.1776	.1994	.0218	0.
			b	.1994	.1774	.1994	.0220	0.
			c	.1994	.1778	.1993	.0215	.0001
31,000	10,000	110,000	a	.1994	.1778	.1994	.0216	0.
			b	.1995	.1778	.1993	.0215	.0002
	0	110,000	c	.1994	.1776	.1993	.0217	.0001
			a	.1994	.1770	.1994	.0224	0.
			b	.1995	.1769	.1993	.0224	.0002
			c	.1994	.1769	.1993	.0224	.0001
32,000	10,000	120,000	a	.1994	.1770	.1993	.0223	.0001
			b	.1994	.1769	.1993	.0224	.0001
	0	120,000	c	.1994	.1768	.1993	.0225	.0001
			a	.1995	.1764	.1994	.0230	.0001
			b	.1994	.1762	.1993	.0231	.0001
			c	.1994	.1760	.1993	.0233	.0001
33,000	10,000	130,000	a	.1994	.1764	.1993	.0229	.0001
			b	.1994	.1764	.1993	.0229	.0001
	0	130,000	c	.1994	.1763	.1992	.0229	.0002
			a	.1994	.1758	.1993	.0235	.0001
			b	.1994	.1758	.1993	.0235	.0001
			c	.1994	.1754	.1993	.0239	.0001
34,000	10,000	140,000	a	.1994	.1755	.1993	.0233	.0001
			b	.1994	.1756	.1993	.0237	.0001
	0	140,000	c	.1994	.1756	.1992	.0236	.0002
			a	.1994	.1746	.1992	.0246	.0002
			b	.1995	.1745	.1994	.0249	.0001
			c	.1994	.1743	.1993	.0250	.0001
35,000	10,000	150,000	a	.1994	.1747	.1994	.0247	0.
			b	.1994	.1748	.1993	.0245	.0001
	0	150,000	c	.1994	.1746	.1993	.0247	.0001
			a	.1994	.1743	.1993	.0250	.0001
			b	.1994	.1743	.1993	.0250	.0001
			c	.1994	.1739	.1993	.0254	.0001
36,000	10,000	160,000	a	.1993	.1740	.1993	.0253	0.
			b	.1994	.1743	.1993	.0250	.0001
	0	160,000	c	.1994	.1739	.1993	.0254	.0001

## No. 31.—O. H. Steel Bar. Mark, 1—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 35,000	0	160,000	<i>a</i>	<i>Inch.</i> .1994	<i>Inch.</i> .1732	<i>Inch.</i> .1993	<i>Inch.</i> .0261	<i>Inch.</i> .0001	
			<i>b</i>	.1994	.1731	.1992	.0261	.0002	
			<i>c</i>	.1994	.1730	.1993	.0263	.0001	
37,000	10,000	170,000	<i>a</i>	.1994	.1733	.1993	.0260	.0001	
			<i>b</i>	.1994	.1732	.1993	.0261	.0001	
			<i>c</i>	.1994	.1732	.1993	.0261	.0001	
37,000	0	170,000	<i>a</i>	.1994	.1726	.1993	.0287	.0001	
			<i>b</i>	.1994	.1724	.1993	.0269	.0001	
			<i>c</i>	.1994	.1724	.1993	.0269	.0001	
38,000	10,000	180,000	<i>a</i>	.1996	.1723	.1994	.0271	.0002	
			<i>b</i>	.1995	.1724	.1994	.0270	.0001	
			<i>c</i>	.1994	.1725	.1993	.0268	.0001	
38,000	0	180,000	<i>a</i>	.1994	.1717	.1993	.0276	.0001	
			<i>b</i>	.1994	.1718	.1992	.0274	.0002	
			<i>c</i>	.1994	.1713	.1993	.0280	.0001	
39,000	10,000	190,000	<i>a</i>	.1995	.1715	.1994	.0279	.0001	
			<i>b</i>	.1995	.1713	.1994	.0274	.0001	
			<i>c</i>	.1994	.1711	.1993	.0282	.0001	
39,000	0	190,000	<i>a</i>	.1994	.1706	.1993	.0287	.0001	
			<i>b</i>	.1995	.1704	.1993	.0289	.0002	
			<i>c</i>	.1994	.1704	.1993	.0289	.0001	
40,000	10,000	200,000	<i>a</i>	.1994	.1711	.1994	.0283	0.	
			<i>b</i>	.1995	.1708	.1993	.0285	.0002	
			<i>c</i>	.1995	.1708	.1993	.0285	.0002	
40,000	0	200,000	<i>a</i>	.1995	.1699	.1993	.0294	.0002	
			<i>b</i>	.1994	.1704	.1993	.0289	.0001	
			<i>c</i>	.1995	.1701	.1993	.0292	.0002	
40,000	10,000	210,000	<i>a</i>	.1994	.1701	.1993	.0292	.0001	
			<i>b</i>	.1996	.1702	.1993	.0291	.0003	
			<i>c</i>	.1996	.1702	.1993	.0291	.0003	

41,000	0	210,000	a	.1996	.1694	.1993	.0299	.0003
			b	.1995	.1696	.1993	.0297	.0002
			c	.1995	.1694	.1992	.0298	.0003
	10,000	220,000	a	.1995	.1695	.1993	.0298	.0002
			b	.1995	.1695	.1992	.0297	.0003
			c	.1995	.1693	.1993	.0300	.0002
42,000	0	220,000	a	.1996	.1685	.1993	.0308	.0003
			b	.1995	.1688	.1993	.0305	.0002
			c	.1995	.1687	.1993	.0306	.0002
	10,000	230,000	a	.1996	.1688	.1993	.0305	.0003
			b	.1997	.1688	.1993	.0305	.0004
			c	.1996	.1688	.1993	.0305	.0003
43,000	0	230,000	a	.1996	.1683	.1993	.0310	.0003
			b	.1997	.1683	.1993	.0310	.0004
			c	.1996	.1680	.1993	.0313	.0003
	10,000	240,000	a	.1998	.1682	.1992	.0310	.0006
			b	.1997	.1678	.1992	.0314	.0005
			c	.1997	.1680	.1992	.0312	.0005
44,000	0	240,000	a	.1998	.1674	.1992	.0318	.0006
			b	.1997	.1675	.1992	.0317	.0005
			c	.1997	.1674	.1992	.0318	.0005
	10,000	250,000	a	.2001	.1672	.1991	.0319	.0010
			b	.1996	.1668	.1990	.0322	.0006
			c	.1998	.1668	.1990	.0322	.0008
45,000	0	250,000	a	.1999	.1666	.1990	.0324	.0009
			b	.1998	.1664	.1989	.0325	.0009
			c	.1998	.1662	.1990	.0328	.0008
	10,000	260,000	a	.1999	.1659	.1988	.0329	.0011
			b	.1994	.1656	.1985	.0329	.0009
			c	.2002	.1655	.1987	.0332	.0015
46,000	0	260,000	a	.2000	.1650	.1987	.0337	.0013
			b	.2000	.1651	.1986	.0335	.0014
			c	.2000	.1648	.1987	.0339	.0013
	10,000	270,000	a	.2005	.1647	.1983	.0336	.0017
			b	.2008	.1647	.1983	.0336	.0015
			c	.2002	.1644	.1983	.0339	.0019
47,000	0	270,000	a	.2004	.1632	.1983	.0351	.0021
			b	.2003	.1631	.1981	.0350	.0022
			c	.2005	.1633	.1982	.0349	.0023

No. 31.—O. H. Steel Bar. *Mark, 1*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Setts.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 48,000	10,000	280,000	<i>a</i>	<i>Inch.</i> .1887 .1992 .2020	<i>Inch.</i> .1618 .1625 .1631	<i>Inch.</i> .1864 .1971 .1978	<i>Inch.</i> .0346 .0346 .0347	<i>Inch.</i> .0033 .0021 .0042	
	0	280,000	<i>a</i> <i>b</i> <i>c</i>	.2010 .2007 .2010	.1619 .1620 .1615	.1977 .1977 .1976	.0358 .0357 .0361	.0033 .0030 .0034	
	10,000	290,000	<i>a</i> <i>b</i> <i>c</i>	.2008 .2030 .2016	.1600 .1609 .1610	.1862 .1969 .1968	.0362 .0360 .0358	.0046 .0061 .0048	
49,000	0	290,000	<i>a</i> <i>b</i> <i>c</i>	.2016 .2015 .2016	.1609 .1610 .1606	.1970 .1970 .1968	.0361 .0360 .0362	.0046 .0045 .0048	
	10,000	300,000	<i>a</i> <i>b</i> <i>c</i>	.1935 .1999 .2053	.1565 .1578 .1589	.1934 .1946 .1969	.0369 .0368 .0370	.0001 .0053 .0096	
	0	300,000	<i>a</i> <i>b</i> <i>c</i>	.2020 .2024 .2032	.1572 .1589 .1590	.1956 .1960 .1961	.0384 .0371 .0371	.0064 .0064 .0071	
50,000	10,000	310,000	<i>a</i> <i>b</i> <i>c</i>	.2003 .2074 .2026	.1555 .1574 .1562	.1923 .1952 .1969	.0378 .0378 .0377	.0070 .0122 .0087	
	0	310,000	<i>a</i> <i>b</i> <i>c</i>	.2036 .2043 .2032	.1563 .1567 .1556	.1947 .1950 .1940	.0384 .0383 .0384	.0089 .0093 .0092	
	10,000	320,000	<i>a</i> <i>b</i> <i>c</i>	.1839 .2095 .2096	.1566 .1578 .1564	.1853 .1918 .1945	.0387 .0382 .0381	.0006 .0177 .0151	
52,000	0	320,000	<i>a</i> <i>b</i> <i>c</i>	.2026 .2060 .2063	.1518 .1541 .1532	.1914 .1933 .1940	.0396 .0392 .0388	.0112 .0127 .0123	



53,000	10,000	530,000	a	.1845	.1388	.1794	.0406	.0051	Bar very hot to the touch.
0	0	330,000	b	.2022	.1568	.1972	.0404	.0050	
			c	.2191	.1715	.2125	.0410	.0066	
	410	830,410							Bar ruptured.

TEST No. 32.—*O. H. Steel from Rod No. 1.*

A constant load was employed throughout the test, giving the maximum fiber stress 53,000 pounds per square inch. The shaft acquired a higher temperature while running, and was cooled with water prior to measuring the deflections and sets following the run of 5,000 turns.

The tensile specimen showed an elastic limit of 51,000 pounds per square inch. The metal in the rod from which this shaft was taken showed yielding and increased elongation under diminished loads after the elastic limit was passed.

The rotating test was discontinued before rupture of the shaft was completed, about 20 per cent. of the sectional area remaining intact, which showed a fine granular appearance when broken over the anvil.

The appearance of the metal ruptured while under rotating test was similar to the fracture of test No. 31, the surface having a smooth, battered appearance.

No. 32.—*O. H. Steel Bar. Mark, 1.*  
 Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflection. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 53,000	0	0	a	Inch. .1997	Inch. .1605	Inch. .1996	Inch. .0391	Inch. .0001	
			b	.2000	.1610	.1999	.0389	.0001	
	1,000	1,000	c	.2001	.1613	.1999	.0386	.0002	
			a	.2031	.1579	.1976	.0397	.0055	
			b	.2021	.1580	.1981	.0401	.0040	
	1,000	2,000	c	.2016	.1584	.1978	.0394	.0038	
			a	.1933	.1554	.1927	.0403	.0006	
			b	.2026	.1557	.1957	.0400	.0069	
			c	.2052	.1564	.1967	.0403	.0095	
	1,000	3,000	a	.2036	.1530	.1939	.0409	.0097	
			b	.1950	.1528	.1931	.0403	.0049	
			c	.2075	.1549	.1954	.0405	.0121	
	1,000	4,000	a	.2104	.1539	.1946	.0407	.0158	
			b	.2022	.1533	.1940	.0407	.0082	
			c	.2053	.1528	.1936	.0408	.0117	
	1,000	5,000	a	.1908	.1473	.1822	.0349	.0086	Temperature of bar greatly increased. Cooled with water before measuring.
			b	.2104	.1530	.1939	.0409	.0165	
			c	.2079	.1526	.1937	.0411	.0142	
	5,000	10,000	a	.1864	.1448	.1855	.0407	.0009	
			b	.2235	.1623	.2009	.0386	.0226	
			c	.2047	.1525	.1929	.0404	.0118	
	5,000	15,000	a	.1856	.1433	.1843	.0410	.0013	
			b	.1881	.1444	.1856	.0412	.0025	
			c	.2265	.1629	.2028	.0399	.0237	
	5,000	20,000	a	.2137	.1673	.2063	.0390	.0074	
			b	.2191	.1732	.2117	.0385	.0074	
			c	.1294	.1348	.1742	.0394	.0052	
	3,100	23,100							Bar ruptured.

TEST No. 33.—*O. H. Steel from Rod No. 1.*

The conditions of test were the same in this experiment as with shaft No. 32, and the endurance under test nearly the same; the total number of rotations being 23,850 for this shaft, against 23,100 for the former.

The metal was ruptured on opposite sides of the shaft, the test being discontinued, leaving 40 per cent. of the sectional area intact.

When finally broken across the anvil the different parts of the fractured surface presented the characteristics previously noted.

## No. 33.—O. H. Steel Bar. Mark, 1.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 53,000	0	0		Inch. .1889 .1892 .1892	Inch. .1602 .1603 .1603	Inch. .1988 .1989 .1989	Inch. .0386 .0383 .0003	Inch. .0001 .0003 .0003	
	1,000	1,000		.2017 .2020 .2009	.1573 .1574 .1572	.1964 .1969 .1957	.0391 .0395 .0395	.0053 .0051 .0042	
	1,000	2,000		.2042 .1993 .2027	.1558 .1549 .1554	.1954 .1949 .1957	.0396 .0400 .0403	.0088 .0044 .0070	
	1,000	3,000		.2072 .2027 .2031	.1538 .1538 .1539	.1942 .1941 .1943	.0404 .0403 .0404	.0130 .0085 .0083	
	1,000	4,000		.1896 .1998 .2093	.1488 .1508 .1531	.1892 .1912 .1939	.0404 .0404 .0408	.0004 .0086 .0154	
	1,000	5,000		.1860 .2065 .2103	.1442 .1502 .1535	.1849 .1910 .1938	.0407 .0408 .0403	.0011 .0155 .0165	
	5,000	10,000		.2212 .1850 .1983	.1741 .1423 .1554	.2118 .1818 .1938	.0377 .0395 .0384	.0094 .0032 .0045	
	5,000	15,000		.1911 .2252 .1919	.1485 .1739 .1459	.1888 .2117 .1854	.0403 .0378 .0395	.0023 .0135 .0065	
	5,000	20,000		.1901 .1748 .2256	.1580 .1342 .1786	.1974 .1737 .2165	.0394 .0395 .0379	.0017 .0011 .0091	
3,850	23,850								Bar ruptured.

Temperature of bar greatly increased. Cooled with water.

TEST No. 34.-- *O. H. Steel from Rod No. 1.*

The shaft was run under the same maximum fiber stress as in the two preceding tests, 53,000 pounds per square inch.

It was annealed in an oil bath at the temperature of 589° to 595° F., after each of six consecutive runs of 5,000 rotations each.

After the final annealing and prior to rupture there were two intervals of rest of 32 and 66 days respectively.

The micrometer readings made before the shaft was rotated showed small permanent sets which increased after running up to the time of annealing.

After each annealing and the concurrent interval of rest the sets were at first small, but increased after the shaft had been run as before. The same phenomena were exhibited by the shaft following the longer periods of rest without annealing.

Low annealing temperatures were employed because it had been shown by other experiments upon alternate stresses by tension and compression that a disturbed elastic limit was sensibly restored by exposure to comparatively low annealing temperatures, hence it was desired to investigate the effect of such annealing upon the ultimate endurance of these shafts.

While in this test and the test of the following shaft, which was also annealed, there is evidence of greatly increased endurance, yet subsequent tests have introduced conflicting evidence upon this point.

The metal which fractured while rotating comprised 60 per cent. of the sectional area. This part of the surface presented a crescent-shape outline, with the dull leaden battered appearance typical to this manner of fracture. The fracture was completed over the anvil, the balance having a silky appearance.

## No. 34.—O. H. Steel Bar. Mark, 1.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 53,000	0	0	<i>a</i>	<i>Inch.</i> .1978 .1980 .1980 .1978	<i>Inch.</i> .1584 .1588 .1574 .1586	<i>Inch.</i> .1977 .1977 .1974	<i>Inch.</i> .0393 .0389 .0003 .0004		
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.1991 .1984 .1984	.1578 .1578 .1573	.1971 .1971 .1967	.0393 .0393 .0013 .0017	.0020	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1988 .2006 .1991	.1563 .1569 .1567	.1958 .1964 .1961	.0395 .0395 .0042 .0030	.0010	
	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.2009 .1987 .1994	.1559 .1560 .1571	.1960 .1958 .1958	.0401 .0398 .0387	.0049	
	2,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.1933 .1998 .2018	.1529 .1546 .1550	.1930 .1946 .1949	.0401 .0400 .0399	.0003 .0052 .0069	
	0	5,000	<i>a</i> <i>b</i> <i>c</i>	.1988 .1983 .1974	.1596 .1590 .1570	.1985 .1981 .1972	.0389 .0361 .0402	.0003 .0002 .0002	
	1,000	6,000	<i>a</i> <i>b</i> <i>c</i>	.1983 .1988 .1978	.1589 .1587 .1573	.1982 .1978 .1969	.0393 .0391 .0391	.0001 .0010 .0009	
	1,000	7,000	<i>a</i> <i>b</i> <i>c</i>	.1973 .1986 .1983	.1582 .1580 .1576	.1978 .1974 .1967	.0396 .0394 .0391	0 .0012 .0016	
	1,000	8,000	<i>a</i> <i>b</i> <i>c</i>	.1975 .1998 .1986	.1574 .1574 .1572	.1972 .1972 .1964	.0398 .0396 .0392	.0003 .0026 .0022	

Bar removed from machine and annealed at temperature of 589° F.  
Interval of rest, 4 days.

## NO. 34.—O. H. Steel Bar. Mark, 1—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.		
Pounds. 53,000	1,000	9,000	a	Inch. .1994 .2002 .1986	Inch. .1574 .1570 .1567	Inch. .1971 .1970 .1962	Inch. .0397 .0400 .0395	Bar annealed second time at temperature of 589° F. second annealing.
	1,000	10,000	a	.1982	.1570	.1968	.0398	
			b	.1982	.1563	.1963	.0400	
			c	.1995	.1563	.1960	.0403	
	0	10,000	a	.1986	.1593	.1985	.0392	
			b	.1984	.1590	.1982	.0392	
			c	.1978	.1585	.1975	.0390	
	1,000	11,000	a	.1982	.1562	.1979	.0397	
			b	.1984	.1561	.1977	.0396	
			c	.1983	.1560	.1971	.0391	
	1,000	12,000	a	.1990	.1580	.1975	.0395	
			b	.1996	.1574	.1972	.0398	
53,000	1,000	13,000	a	.1984	.1571	.1966	.0395	Rested 36 hours then annealed at temperature of 589° F. third annealing, and allowed to rest 30 hours.
			b	.1985	.1569	.1966	.0397	
			c	.1993	.1566	.1963	.0397	
	1,000	14,000	a	.2008	.1574	.1973	.0398	
			b	.1989	.1571	.1967	.0396	
			c	.1989	.1564	.1961	.0397	
	1,000	15,000	a	.1972	.1566	.1963	.0397	
			b	.1964	.1563	.1961	.0398	
			c	.1999	.1561	.1959	.0398	
	0	15,000	a	.1987	.1594	.1986	.0392	
			b	.1986	.1590	.1983	.0393	
			c	.1975	.1562	.1973	.0391	
53,000	1,000	16,000	a	.1981	.1584	.1978	.0394	
			b	.1985	.1582	.1976	.0394	
			c	.1982	.1576	.1968	.0392	



Weight	Temperature	Bar straightened, and annealed at temperature of 589° F., fourth annealing.	Bar straightened, and annealed at temperature of 589° F., fifth annealing, interval of rest, one day.
1,000	17,000	.0397 .0005	.0397 .0005
		.0399 .0016 .0392	.0399 .0016 .0392
1,000	18,000	.0399 .0034 .0399 .0031 .0396	.0399 .0034 .0399 .0031 .0396
1,000	19,000	.0397 .0009 .0397 .0021 .0394 .0037	.0397 .0009 .0397 .0021 .0394 .0037
1,000	20,000	.0399 .0002 .0399 .0032 .0398 .0040	.0399 .0002 .0399 .0032 .0398 .0040
0	20,000	.0392 .0002 .0392 .0003	.0392 .0002 .0392 .0003
1,000	21,000	.0398 .0013 .0393 .0394 .0396 .0018 .0395	.0398 .0013 .0393 .0394 .0396 .0018 .0395
1,000	22,000	.0399 .0029 .0397 .0021 .0398 .0037	.0399 .0029 .0397 .0021 .0398 .0037
1,000	23,000	.0398 .0023 .0396 .0024 .0398 .0041 .0397 .0017 .0399 .0032 .0399 .0035	.0398 .0023 .0396 .0024 .0398 .0041 .0397 .0017 .0399 .0032 .0399 .0035
0	25,000	.0392 .0002 .0392 .0003 .0391	.0392 .0002 .0392 .0003 .0391
1,000	26,000	.0396 .0001 .0396 .0021 .0396 .0016	.0396 .0001 .0396 .0021 .0396 .0016

Bar straightened, and annealed at temperature of 589° F., fourth annealing.

Bar straightened, and annealed at temperature of 539° F., fifth annealing; interval of rest, one day.



53,000	0	35,000	a b c	1985 1988 1987	1506 1584 1584	1985 1985 1983	.0359 .0391 .0389	0.	.0003 .0004
1,000	1,000	36,000	a b c	1972 2004 1995	1576 1578 1576	1970 1972 1971	.0394 .0392 .0395	.0002 .0032 .0024	
1,000	1,000	37,000	a b c	1978 2012 1994	1571 1573 1569	1969 1970 1966	.0398 .0387 .0397	.0009 .0042 .0028	
1,000	1,000	38,000	a b c	2009 1988 2001	1571 1565 1568	1971 1964 1964	.0400 .0399 .0396	.0038 .0024 .0037	
0	0	38,000	a b c	1992 1984 1980	1599 1590 1585	1991 1982 1978	.0392 .0392 .0393	.0001 .0002 .0002	Bar rested 66 days.
1,000	1,000	39,000	a b c	2006 1990 1989	1583 1574 1573	1979 1972 1968	.0396 .0398 .0395	.0027 .0018 .0021	
1,000	1,000	40,000	a b c	1966 2002 1997	1569 1570 1570	1965 1966 1966	.0396 .0396 .0396	.0001 .0036 .0032	
14,850	14,850	54,850							Bar ruptured.

TEST No. 35.—*O. H. Steel from Rod No. 1.*

Tested under 53,000 pounds per square inch maximum fiber stress and annealed at 595° F. after intervals of 10,000 rotations. Small permanent sets were displayed, due to loading before the shaft was rotated. After rotation the sets increased, but were diminished at each successive annealing.

A period of rest of 24 hours after the shaft had made 20,000 rotations was not followed by any material reduction in the sets, in this respect differing from the preceding shaft.

The test was discontinued when 40 per cent. of the sectional area was ruptured. The principal fracture extended inward from one side of the shaft; a small crack on the opposite side had begun to develop. The balance of the fracture when completed over the anvil displayed a granular appearance.

A few additional rotations would have completed the rupture of these shafts in the testing apparatus, the tests generally being discontinued at a time immediately preceding complete rupture, when there was violent wobbling of the shaft.

## No. 35.—O. H. Steel Bar. Mark, 1.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 53,000	0	0	a	Inch. .1394 .1395 .1394	Inch. .1601 .1603 .1602	Inch. .1992 .1992 .1993	Inch. .0391 .0389 .0391	Inch. .0002 .0003 .0001	
	1,000	1,000	a b c	.1973 .1993 .2038	.1555 .1560 .1572	.1965 .1968 .1970	.0400 .0398 .0398	.0018 .0035 .0068	
	1,000	2,000	a b c	.2017 .1978 .2064	.1537 .1528 .1554	.1939 .1928 .1956	.0402 .0400 .0402	.0078 .0050 .0108	
	1,000	3,000	a b c	.1932 .2002 .2050	.1497 .1537 .1538	.1903 .1940 .1943	.0406 .0403 .0435	.0029 .0152 .0107	
	1,000	4,000	a b c	.2087 .1987 .2071	.1521 .1500 .1529	.1930 .1904 .1937	.0409 .0404 .0408	.0157 .0083 .0134	
	1,000	5,000	a b c	.1998 .2121 .2050	.1483 .1527 .1509	.1895 .1931 .1919	.0412 .0404 .0410	.0003 .0190 .0131	
	1,000	6,000	a b c	.2138 .2006 .2074	.1514 .1490 .1508	.1922 .1898 .1920	.0408 .0408 .0412	.0216 .0108 .0152	
	1,000	7,000	a b c	.2020 .2147 .2058	.1460 .1512 .1492	.1875 .1919 .1991	.0415 .0407 .0419	.0145 .0228 .0667	
	1,000	8,000	a b c	.1934 .2155 .2064	.1457 .1513 .1503	.1869 .1918 .1912	.0412 .0405 .0409	.0065 .0237 .0152	

No. 35.—O. H. Steel Bar. *Mark, 1—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded. <i>Inch.</i>	Loaded. <i>Inch.</i>	Unloaded. <i>Inch.</i>			
<i>Pounds.</i>	1, 000	9, 000	<i>a</i>	.2144	.1487	.1800	.0244		
			<i>b</i>	.2101	.1496	.1805	.0196		
			<i>c</i>	.2070	.1493	.1803	.0167		
1, 000		10, 000	<i>a</i>	.2143	.1493	.1807	.0236		
			<i>b</i>	.1989	.1461	.1872	.0117		
			<i>c</i>	.2098	.1495	.1809	.0189		
53, 000	0	10, 000	<i>a</i>	.1997	.1605	.1894	.0003		Bar annealed at temperature of 595° F.; first annealing. Interval of rest, 5 days.
			<i>b</i>	.2001	.1609	.1898	.0003		
			<i>c</i>	.1999	.1606	.1895	.0004		
1, 000		11, 000	<i>a</i>	.2001	.1594	.1888	.0013		
			<i>b</i>	.2008	.1598	.1892	.0016		
			<i>c</i>	.2004	.1595	.1888	.0016		
1, 000		12, 000	<i>a</i>	.2019	.1582	.1879	.0040		
			<i>b</i>	.2004	.1584	.1880	.0024		
			<i>c</i>	.2012	.1583	.1878	.0034		
1, 000		13, 000	<i>a</i>	.1986	.1559	.1859	.0027		
			<i>b</i>	.1993	.1559	.1858	.0085		
			<i>c</i>	.2038	.1570	.1869	.0069		
1, 000		14, 000	<i>a</i>	.1951	.1535	.1837	.0014		
			<i>b</i>	.2058	.1558	.1857	.0101		
			<i>c</i>	.2036	.1558	.1859	.0077		
1, 000		15, 000	<i>a</i>	.2039	.1532	.1836	.0103		
			<i>b</i>	.2067	.1546	.1847	.0120		
			<i>c</i>	.2038	.1541	.1845	.0093		
1, 000		16, 000	<i>a</i>	.1902	.1486	.1892	.0010		
			<i>b</i>	.2047	.1523	.1827	.0120		
			<i>c</i>	.2082	.1544	.1848	.0134		
1, 000		17, 000	<i>a</i>	.1933	.1503	.1910	.0023		
			<i>b</i>	.1982	.1501	.1906	.0076		
			<i>c</i>	.2100	.1544	.1945	.0155		

1,000	15,000	a b c	1,894 2,017 2,105	1,478 1,504 1,542	1,857 1,908 1,943	.0409 .0404 .0401	.0007 .0109 .0162
1,000	19,000	a b c	.2110 .2010 .2068	.1523 .1508 .1523	.1933 .1914 .1929	.0410 .0406 .0406	.0177 .0096 .0139
1,000	20,000	a b c	.1906 .1976 .2120	.1484 .1483 .1530	.1892 .1892 .1986	.0408 .0409 .0408	.0014 .0074 .0152
0	20,000	a b c	.2048 .2035 .2061	.1528 .1521 .1536	.1929 .1934 .1941	.0401 .0403 .0406	.0119 .0131 .0120
0	20,000	a b c	.1998 .2031 .2057	.1522 .1523 .1538	.1927 .1925 .1940	.0405 .0402 .0402	.0071 .0106 .0117
0	20,000	a b c	.2002 .1991 .2004	.1609 .1600 .1612	.2002 .1989 .2002	.0393 .0389 .0410	0. .0002 .0002
1,000	21,000	a b c	.1095 .1992 .2018	.1592 .1579 .1591	.1987 .1973 .1985	.0395 .0394 .0394	.0008 .0019 .0033
1,000	22,000	a b c	.2000 .1992 .2042	.1568 .1552 .1565	.1965 .1951 .1966	.0397 .0391 .0401	.0035 .0041 .0076
1,000	23,000	a b c	.1945 .2009 .2046	.1535 .1544 .1549	.1928 .1946 .1951	.0403 .0402 .0402	.0017 .0123 .0095
1,000	24,000	a b c	.1925 .1989 .2091	.1510 .1512 .1544	.1918 .1916 .1949	.0408 .0404 .0405	.0007 .0073 .0142
1,000	25,000	a b c	.2107 .2012 .2058	.1533 .1515 .1534	.1940 .1922 .1937	.0407 .0407 .0403	.0167 .0090 .0121
1,000	26,000	a b c	.2049 .1975 .2100	.1513 .1488 .1537	.1921 .1894 .1942	.0408 .0406 .0405	.0123 .0081 .0158
1,000	27,000	a b c	.2031 .2106 .2049	.1503 .1523 .1518	.1912 .1930 .1925	.0409 .0407 .0407	.0119 .0176 .0124

Rested 24 hours.

Bar straightened.

Bar straightened, and annealed at temperature of 593° F., second annealing. Interval of rest, 21 days.

\$3,000

## No. 35.—O. H. Steel Bar. Mark, 1—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i>  53,000	1,000	28,000	<i>a</i>	<i>Inch.</i> .2017 .1971 .2116	<i>Inch.</i> .1498 .1477 .1535	<i>Inch.</i> .1906 .1886 .1940	<i>Inch.</i> .0408 .0409 .0405	<i>Inch.</i> .0111 .0085 .0176	Bar straightened, and annealed at temperature of 535° F., third annealing.
	1,000	29,000	<i>a</i>	.1868	.1445	.1855	.0410	.0013	
			<i>b</i>	.2078	.1504	.1912	.0403	.0166	
			<i>c</i>	.2110	.1533	.1939	.0406	.0171	
	1,000	30,000	<i>a</i>	.1957	.1477	.1890	.0413	.0067	
			<i>b</i>	.2126	.1520	.1928	.0408	.0198	
			<i>c</i>	.2059	.1515	.1925	.0410	.0134	
	0	30,000	<i>a</i>	.1995	.1601	.1993	.0392	.0002	
			<i>b</i>	.1994	.1601	.1992	.0391	.0002	
			<i>c</i>	.2008	.1615	.2005	.0390	.0003	
	1,000	31,000	<i>a</i>	.1987	.1586	.1981	.0395	.0006	
			<i>b</i>	.2010	.1589	.1983	.0394	.0027	
			<i>c</i>	.2015	.1598	.1993	.0395	.0022	
	1,000	32,000	<i>a</i>	.1980	.1559	.1958	.0399	.0022	
			<i>b</i>	.2040	.1567	.1966	.0399	.0074	
			<i>c</i>	.2025	.1575	.1974	.0399	.0051	
	1,000	33,000	<i>a</i>	.1983	.1534	.1937	.0403	.0046	
			<i>b</i>	.2005	.1550	.1952	.0402	.0113	
			<i>c</i>	.2038	.1556	.1957	.0401	.0081	
	1,000	34,000	<i>a</i>	.1916	.1507	.1912	.0405	.0004	
			<i>b</i>	.2005	.1517	.1921	.0404	.0084	
			<i>c</i>	.2082	.1549	.1953	.0404	.0129	
	1,000	35,000	<i>a</i>	.2103	.1532	.1940	.0408	.0163	
			<i>b</i>	.2018	.1521	.1927	.0406	.0091	
			<i>c</i>	.2055	.1535	.1939	.0404	.0116	
	1,000	36,000	<i>a</i>	.1948	.1492	.1901	.0409	.004	
			<i>b</i>	.2105	.1530	.1935	.0405	.0176	
			<i>c</i>	.2059	.1538	.1941	.0403	.0118	



Bar straightened, and annealed at temperature of 595° F.  
fourth annealing.

1, 000	37, 000	a	2006 .2007 .2037	.1502 .1524 .1525	.1910 .1937 .1930	.0408 .0403 .0405	.0096 .0170 .0117
1, 000	38, 000	a	.2114	.1521	.1928	.0407	.0186
		b	.2061	.1519	.1925	.0406	.0136
		c	.2054	.1524	.1929	.0405	.0125
1, 000	39, 000	a	.1871	.1453	.1865	.0412	.0006
		b	.2005	.1503	.1910	.0407	.0145
		c	.2108	.1537	.1941	.0404	.0167
1, 000	40, 000	a	.2024	.1494	.1904	.0410	.0120
		b	.2109	.1529	.1931	.0402	.0178
		c	.2056	.1518	.1924	.0406	.0132
0	40, 000	a	.2001	.1608	.2000	.0392	.0001
		b	.2003	.1610	.2000	.0390	.0003
		c	.1966	.1604	.1963	.0389	.0003
1, 000	41, 000	a	.2003	.1594	.1987	.0393	.0016
		b	.2000	.1594	.1987	.0393	.0013
		c	.2010	.1589	.1983	.0394	.0027
1, 000	42, 000	a	.2013	.1573	.1971	.0398	.0042
		b	.2034	.1578	.1975	.0397	.0039
		c	.2016	.1572	.1969	.0397	.0047
1, 000	43, 000	a	.2020	.1553	.1953	.0400	.0067
		b	.2088	.1540	.1943	.0403	.0045
		c	.2053	.1558	.1900	.0402	.0093
1, 000	44, 000	a	.2067	.1543	.1945	.0402	.0122
		b	.2055	.1547	.1949	.0402	.0106
		c	.2036	.1544	.1946	.0402	.0090
1, 000	45, 000	a	.1932	.1534	.1929	.0395	.0003
		b	.2091	.1548	.1942	.0394	.0149
		c	.2054	.1542	.1946	.0404	.0108
1, 000	46, 000	a	.2044	.1512	.1923	.0410	.0122
		b	.2096	.1536	.1940	.0404	.0156
		c	.2039	.1529	.1934	.0415	.0105
1, 000	47, 000	a	.1915	.1476	.1800	.0414	.0025
		b	.2111	.1537	.1838	.0401	.0173
		c	.2061	.1531	.1937	.0406	.0124
1, 000	48, 000	a	.2026	.1486	.1902	.0416	.0194
		b	.1974	.1487	.1898	.0411	.0076
		c	.2113	.1535	.1943	.0408	.0170



TEST No. 50.—*O. H. Steel from Rod No. 2.*

This shaft and the others from the same rod were run under the constant fiber stress of 50,000 pounds per square inch until ruptured.

The initial loading before rotating showed small sets, which were very much increased at the completion of 1,000 turns, and so continued to the end of the experiment.

A typical fracture occurred.

## No. 50.—O. H. Steel Bar. Mark, 2.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.			Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.		
Pounds. 50,000	0	0		Inch. .1893 .1895 .1996	Inch. .1614 .1619 .1618	Inch. .0377 .0373 .0373	Inch. .0002 .0003 .0005	
	1,000	1,000	a b c	.1993 .1989 .2083	.1523 .1533 .1556	.0384 .0386 .0384	.0026 .0070 .0143	
	1,000	2,000	a b c	.1973 .2138 .2059	.1486 .1539 .1519	.0386 .0387 .0388	.0101 .0212 .0152	
1,000	1,000	3,000	a b c	.1829 .2161 .2116	.1406 .1525 .1523	.0391 .0386 .0389	.0032 .0250 .0204	
	1,000	4,000	a b c	.2173 .2098 .2070	.1493 .1514 .1509	.0385 .0390 .0386	.0285 .0194 .0175	
	1,000	5,000	a b c	.2117 .1959 .2135	.1492 .1463 .1526	.0394 .0391 .0385	.0231 .0105 .0224	
5,000	5,000	10,000	a b c	.2240 .1848 .2018	.1749 .1423 .1566	.0384 .0379 .0370	.0127 .0041 .0080	
	5,000	15,000						Bar ruptured.

TEST NO. 51.—*O. H. Steel from Rod No. 2.*

Duplicate test of No. 50, excepting this shaft was annealed in an oil bath at the temperature of 500° F. upon the completion of 13,000 rotations.

Small sets were shown during the initial loading, which were increased, however, after rotating, again diminished after annealing, and then increased as the test progressed.

## No. 51.—O. H. Steel Bar. Mark, 2.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 50,000	0	0		Inch. .1892 .1894 .1893	Inch. .1621 .1617 .1618	Inch. .1890 .1890 .1889	Inch. .0369 .0373 .0371	Inch. .0002 .0004 .0004	
	1,000	1,000	a b c	.1888 .2036 .2075	.1505 .1553 .1549	.1889 .1834 .1934	.0384 .0381 .0385	.0009 .0102 .0141	
	1,000	2,000	a b c	.1889 .2066 .2130	.1495 .1620 .1530	.1824 .1903 .1915	.0329 .0383 .0385	.0015 .0163 .0215	
	1,000	3,000	a b c	.1820 .2083 .2142	.1410 .1514 .1522	.1802 .1899 .1904	.0392 .0385 .0382	.0018 .0184 .0238	
	1,000	4,000	a b c	.1810 .2037 .2170	.1404 .1495 .1518	.1799 .1883 .1908	.0395 .0391 .0388	.0011 .0154 .0262	
	1,000	5,000	a b c	.1922 .2212 .2079	.1498 .1538 .1480	.1823 .1919 .1877	.0395 .0391 .0386	.0099 .0293 .0202	
	5,000	10,000	a b c	.1749 .2281 .2008	.1361 .1815 .1586	.1743 .2177 .1852	.0382 .0362 .0372	.0006 .0104 .0050	
	0	10,000	a b c	.1999 .2041 .2010	.1566 .1647 .1617	.1935 .2018 .1978	.0369 .0371 .0361	.0064 .0023 .0032	Bar rested 40 days.
	1,000	11,000	a b c	.2038 .2170 .2053	.1460 .1555 .1489	.1854 .1938 .1879	.0394 .0383 .0390	.0184 .0232 .0174	

50,000	1,000	12,000	a b c	2,130 2,050 2,080	.1493 .1509 .1486	.1886 .1894 .1875	.0393 .0385 .0389	.0304 .0156 .0214
	1,000	13,000	a b c	.1857 .1979 .2186	.1422 .1474 .1526	.1816 .1864 .1908	.0394 .0390 .0382	.0041 .0115 .0278
0	13,000		a b c	.2006 .1996 .1991	.1686 .1624 .1619	.2006 .1895 .1989	.0370 .0371 .0370	0 .0001 .0002
1,000	14,000		a b c	.2042 .2018 .2005	.1606 .1598 .1681	.1985 .1974 .1958	.0379 .0376 .0377	.0057 .0044 .0047
1,000	15,000		a b c	.2057 .2076 .2040	.1545 .1567 .1541	.1931 .1949 .1924	.0386 .0382 .0383	.0126 .0127 .0116
1,000	16,000		a b c	.1921 .1985 .2133	.1486 .1503 .1537	.1873 .1889 .1918	.0387 .0386 .0381	.0048 <sup>a</sup> .0096 .0215
1,000	17,000		a b c	.2165 .2072 .2069	.1516 .1526 .1503	.1905 .1913 .1889	.0389 .0387 .0386	.0200 .0159 .0180
1,000	18,000		a b c	.1809 .2146 .2135	.1388 .1518 .1508	.1784 .1807 .1900	.0396 .0389 .0392	.0025 .0230 .0235
1,500	19,500							

Bar ruptured.

Bar heated in oil bath to 500° F. Kept at this temperature 1 hour, then allowed to cool slowly in bath, first annealing.

TEST No. 52.—*O. H. Steel from Rod No. 2.*

The test was interrupted at the completion of 10,000 rotations, and rested without load for a period of 41 days. Loading and measuring the shaft after resting, the sets were very small, but were increased when measured after completing 1,000 rotations additional.

The shaft was annealed twice, after 13,000 and 23,000 rotations respectively, the effect of which was shown by the diminished sets as before mentioned in other tests.

Increased sets followed the renewal of the test, yet from the gradual manner of their increase the shaft was apparently slow to resume its former condition.

A typical fracture occurred.



## No. 52.—O. H. Steel Bar. Mark, 2.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 50,000	0	0	a	Inch. .2000 .1893 .1995	Inch. .1892 .1613 .1617	Inch. .1998 .1992 .1992	Inch. .0376 .0377 .0375		
	1,000	1,000	a b c	.2023 .2041 .2024	.1571 .1577 .1580	.1956 .1939 .1963	.0385 .0382 .0383	.0067 .0082 .0061	
	1,000	2,000	a b c	.2090 .1995 .2063	.1553 .1540 .1553	.1942 .1925 .1941	.0389 .0385 .0388	.0148 .0070 .0122	
	1,000	3,000	a b c	.2126 .2045 .2060	.1540 .1531 .1532	.1928 .1920 .1922	.0388 .0389 .0390	.0198 .0125 .0138	
	1,000	4,000	a b c	.2135 .2069 .2060	.1530 .1528 .1525	.1921 .1918 .1912	.0391 .0390 .0387	.0214 .0151 .0148	
	1,000	5,000	a b c	.1874 .1900 .2139	.1473 .1503 .1547	.1864 .1892 .1893	.0391 .0389 .0386	.0010 .0098 .0206	
	5,000	10,000	a b c	.1952 .2219 .2006	.1509 .1614 .1496	.1887 .1883 .1881	.0378 .0369 .0365	.0075 .0236 .0125	
	0	10,000	a b c	.2001 .2013 .1995	.1613 .1627 .1606	.1990 .2004 .1980	.0377 .0377 .0374	.0011 .0009 .0615	Bar rested 41 days.
	1,000	11,000	a b c	.2122 .2095 .2050	.1521 .1543 .1521	.1915 .1936 .1908	.0394 .0388 .0387	.0207 .0159 .0142	

## No. 52.—O. H. Steel Bar. Mark, 2—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 50,000	1,000	12,000	a	Inch. .1842	Inch. .1470	Inch. .1868	Inch. .0398	Inch. .0074	Bar heated to 500° F. in oil bath, and kept at that temperature for 1 hour; cooled slowly in oil bath; first annealing.
			b	.1974	.1488	.1879	.0381	.0085	
			c	.2150	.1531	.1919	.0388	.0231	
1,000		13,000	a	.2031	.1486	.1880	.0394	.0151	
			b	.2164	.1538	.1929	.0391	.0235	
			c	.2046	.1499	.1890	.0391	.0156	
0		13,000	a	.2005	.1634	.2003	.0369	.0002	
			b	.2001	.1626	.2000	.0374	.0001	
			c	.1995	.1619	.1992	.0373	.0003	
1,000		14,000	a	.1986	.1606	.1984	.0378	.0002	
			b	.2021	.1608	.1985	.0377	.0035	
			c	.2005	.1596	.1972	.0376	.0033	
1,000		15,000	a	.1996	.1581	.1965	.0384	.0031	
			b	.2004	.1578	.1960	.0382	.0044	
			c	.2032	.1571	.1962	.0381	.0040	
1,000		16,000	a	.2005	.1571	.1961	.0390	.0134	
			b	.2031	.1568	.1952	.0384	.0079	
			c	.2034	.1550	.1933	.0383	.0101	
1,000		17,000	a	.2035	.1538	.1926	.0388	.0100	
			b	.1987	.1521	.1910	.0389	.0077	
			c	.2088	.1547	.1931	.0384	.0157	
1,000		18,000	a	.2066	.1534	.1926	.0392	.0140	
			b	.1985	.1513	.1905	.0392	.0080	
			c	.2087	.1538	.1924	.0386	.0163	
5,000		23,000	a	.2122	.1535	.1932	.0397	.0190	
			b	.1959	.1466	.1862	.0396	.0097	
			c	.2102	.1522	.1922	.0390	.0180	

Bar annealed same manner as before at temperature of 500° F.; second annealing.



TEST No. 53.—*O. H. Steel from Rod No. 2.*

The shaft made 5,000 rotations and then rested without load 41 days. The sets which were observed after resting were small compared with those which preceded, but this apparent rigidity was lost when rotations began.

The shaft was annealed six times at 500° F. at intervals of 5,000 rotations, the first annealing being done when 8,000 rotations had been made.

A temporary reduction in the sets followed each annealing.

## No. 53.—O. H. Steel Bar. Mark, 2.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 50,000	0	0	a	Inch. .1894 .1895 .1898	Inch. .1614 .1614 .1614	Inch. .1893 .1892 .1895	Inch. .0379 .0378 .0381	Inch. .0001 .0003 .0003	
	1,000	1,000	a b c	.1884 .1888 .2066	.1544 .1548 .1566	.1932 .1935 .1956	.0388 .0387 .0390	.0052 .0053 .0110	
	1,000	2,000	a b c	.1914 .1983 .2107	.1500 .1520 .1546	.1893 .1911 .1940	.0393 .0391 .0394	.0021 .0072 .0167	
	1,000	3,000	a b c	.2023 .1968 .2128	.1495 .1494 .1539	.1890 .1888 .1932	.0395 .0394 .0393	.0133 .0080 .0196	
	1,000	4,000	a b c	.1840 .2078 .2132	.1426 .1511 .1534	.1825 .1905 .1929	.0399 .0394 .0395	.0015 .0171 .0203	
	1,000	5,000	a b c	.1850 .2136 .2107	.1425 .1527 .1524	.1821 .1818 .1819	.0396 .0391 .0395	.0029 .0218 .0186	
	0	5,000	a b c	.1894 .2004 .2006	.1607 .1618 .1617	.1985 .1996 .1996	.0378 .0378 .0379	.0009 .0008 .0010	Bar rested 41 days.
	1,000	6,000	a b c	.1979 .1985 .2111	.1500 .1511 .1549	.1895 .1903 .1935	.0395 .0392 .0386	.0084 .0082 .0176	
	1,000	7,000	a b c	.2103 .1991 .2086	.1522 .1508 .1550	.1918 .1903 .1925	.0396 .0395 .0395	.0185 .0088 .0161	

No. 53.—O. H. Steel Bar. *Mark, 2*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded. <i>Inch.</i>	Loaded. <i>Inch.</i>	Unloaded. <i>Inch.</i>			
<i>Pounds.</i>	1, 000	8, 000	<i>a</i> <i>b</i> <i>c</i>	.2110 .1982 .2108	.1512 .1496 .1533	.1911 .1911 .1926	.0399 .0386 .0393	.0199 .0090 .0177	Heated to 500° F. in oil bath and kept at that temperature for one hour; cooled slowly in oil bath; first annealing.
	0	8, 000	<i>a</i> <i>b</i> <i>c</i>	.2013 .1991 .1993	.1635 .1613 .1615	.2010 .1969 .1991	.0375 .0376 .0376	.0003 .0002 .0002	
	1, 000	9, 000	<i>a</i> <i>b</i> <i>c</i>	.1997 .1991 .2009	.1614 .1591 .1601	.1985 .1971 .1980	.0381 .0380 .0379	.0002 .0020 .0029	
	1, 000	10, 000	<i>a</i> <i>b</i> <i>c</i>	.2041 .2028 .2014	.1595 .1578 .1579	.1979 .1961 .1962	.0384 .0383 .0383	.0062 .0067 .0052	
	1, 000	11, 000	<i>a</i> <i>b</i> <i>c</i>	.1991 .2057 .2029	.1564 .1568 .1563	.1953 .1952 .1950	.0389 .0384 .0387	.0038 .0105 .0079	
	1, 000	12, 000	<i>a</i> <i>b</i> <i>c</i>	.1929 .2003 .2071	.1534 .1543 .1658	.1925 .1931 .1948	.0391 .0388 .0390	.0004 .0072 .0123	
	1, 000	13, 000	<i>a</i> <i>b</i> <i>c</i>	.1969 .2085 .2041	.1535 .1556 .1548	.1926 .1944 .1939	.0391 .0388 .0391	.0043 .0141 .0102	
	0	13, 000	<i>a</i> <i>b</i> <i>c</i>	.2000 .1995 .1994	.1624 .1618 .1616	.1998 .1993 .1992	.0374 .0375 .0376	.0002 .0002 .0002	
	1, 000	14, 000	<i>a</i> <i>b</i> <i>c</i>	.1980 .2003 .2011	.1599 .1597 .1800	.1977 .1975 .1979	.0378 .0378 .0379	.0003 .0028 .0032	
	1, 000	15, 000	<i>a</i> <i>b</i> <i>c</i>	.2049 .2016 .2019	.1585 .1576 .1575	.1972 .1961 .1961	.0387 .0385 .0386	.0077 .0055 .0053	
									Bar annealed at 500° F. in same manner as before; second annealing.

1,000	16,000	a b c	1894 .2026 .2050 1,000 17,000 2035 2039 2049 2031 1,000 18,000 1910 2039 2062 0 18,000 2000 2004 1890 1,000 19,000 1999 2027 2008 1,000 20,000 1890 2044 1,000 21,000 1928 2032 2057 1,000 22,000 1962 2070 2037 1,000 23,000 1959 2070 2045 0 23,000 2004 1995 1994 1,000 24,000 2013 1992 2026 1,000 25,000 1944 2045 2040	1541 .1556 .1568 1554 .1563 .1559 1520 1550 1558 1623 1626 1613 1595 1596 1590 1569 1562 1571 1533 1560 1565 1541 1564 1558 1538 1560 1555 1624 1617 1615 1589 1580 1588 1548 1568 1571	1929 .1943 .1855 1944 1949 1045 1910 1936 1946 1999 2002 1958 1976 1978 1970 1956 1947 1958 1923 1946 1953 1933 1951 1947 1930 1947 1945 2003 1993 1991 1972 1961 1970 1936 1957	.0388 .0387 .0387 .0390 .0386 .0386 .0390 .0386 .0388 .0376 .0376 .0375 .0381 .0380 .0380 .0387 .0385 .0387 .0389 .0392 .0387 .0389 .0392 .0387 .0390 0379 .0376 .0376 0383 .0381 .0382 0388 .0385 0386 0386 0385 0386	.0005 .0083 .0095 .0091 .0110 .0086 .0009 .0003 .0116 .0001 .0002 .0002 .0023 .0049 .0038 .0064 .0043 .0086 .0005 .0086 .0104 .0029 .0119 .0090 .0123 .0100 .0001 .0002 .0003 .0041 .0031 .0056 .0008 .0092 .0083
-------	--------	-------------	---	--	--	--	---

Bar annealed at 500° F. in same manner as before; third annealing.

Bar annealed at 500° F. in same manner as before; fourth annealing.

## No. 53.—O. H. Steel Bar. Mark, 2—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Sets.	Deflections. <i>Inch.</i>	Remarks.
	Successive.	Total	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i>	1, 000	26, 000	<i>a</i> 1946 <i>b</i> 1991 <i>c</i> 2061	<i>Inch.</i> .1946 .1991 .2061	<i>Inch.</i> .1548 .1553 .1567	<i>Inch.</i> .1938 .1938 .1954	<i>Inch.</i> .0390 .0908 .0953 .0107		
	1, 000	27, 000	<i>a</i> 1987 <i>b</i> 2066 <i>c</i> 2052	<i>Inch.</i> .1987 .2066 .2052	<i>Inch.</i> .1553 .1567 .1558	<i>Inch.</i> .1941 .1933 .1945	<i>Inch.</i> .0398 .0386 .0387 .0446 .0113 .0087		
	1, 000	28, 000	<i>a</i> 1923 <i>b</i> 2016 <i>c</i> 2067	<i>Inch.</i> .1923 .2016 .2067	<i>Inch.</i> .1530 .1547 .1564	<i>Inch.</i> .1918 .1934 .1951	<i>Inch.</i> .0388 .0387 .0387 .0905 .0982 .0116		Bar annealed at 500° F. in same manner as before; fifth anneal- ing.
	0	28, 000	<i>a</i> 1995 <i>b</i> 2001 <i>c</i>	<i>Inch.</i> .2000 .1995 .2001	<i>Inch.</i> .1626 .1619 .1620	<i>Inch.</i> .2000 .1992 .1997	<i>Inch.</i> .0274 .0373 .0377 .0003 .0004	0.	
	1, 000	29, 000	<i>a</i> 2037 <i>b</i> 2017 <i>c</i>	<i>Inch.</i> .2038 .2017 .	<i>Inch.</i> .1590 .1580 .	<i>Inch.</i> .1973 .1966 .	<i>Inch.</i> .0383 .0386 .	.0065 .0061 .0051	
	1, 000	30, 000	<i>a</i> 2008 <i>b</i> 2053 <i>c</i>	<i>Inch.</i> .1942 .2008 .2053	<i>Inch.</i> .1552 .1561 .1570	<i>Inch.</i> .1936 .1948 .1959	<i>Inch.</i> .0384 .0387 .0389 .0066 .0060 .0034		
	1, 000	31, 000	<i>a</i> 2039 <i>b</i> 2056 <i>c</i>	<i>Inch.</i> .1931 .2039 .2056	<i>Inch.</i> .1537 .1560 .1569	<i>Inch.</i> .1925 .1946 .1956	<i>Inch.</i> .0388 .0386 .0387 .0066 .0063 .0100		
	1, 000	32, 000	<i>a</i> 2051 <i>b</i> 2035 <i>c</i>	<i>Inch.</i> .2051 .2035 .2032	<i>Inch.</i> .1560 .1566 .1557	<i>Inch.</i> .1949 .1952 .1945	<i>Inch.</i> .0380 .0286 .0388 .0102 .0103 .0087		
	1, 000	33, 000	<i>a</i> 2055 <i>b</i> 2056 <i>c</i>	<i>Inch.</i> .2055 .2056 .2034	<i>Inch.</i> .1559 .1561 .1553	<i>Inch.</i> .1948 .1949 .1944	<i>Inch.</i> .0389 .0388 .0391 .0107 .0107 .0090		Bar annealed at 500° F. in same manner as before; sixth anneal- ing.
	0	33, 000	<i>a</i> 2001 <i>b</i> 1991 <i>c</i>	<i>Inch.</i> .2005 .2001 .1991	<i>Inch.</i> .1629 .1623 .1613	<i>Inch.</i> .2004 .1993 .1989	<i>Inch.</i> .0375 .0376 .0376 .0001 .0002 .0002		



1,000	34,000	a b c	.2043 .2033 .2015	.1588 .1583 .1574	.1972 .1966 .1959	.0384 .0383 .0385	.0071 .0067 .0056
1,000	35,000	a b c	.2018 .1989 .2033	.1563 .1551 .1566	.1952 .1939 .1955	.0389 .0388 .0389	.0066 .0050 .0098
1,000	36,000	a b c	.1991 .1989 .2062	.1554 .1543 .1564	.1943 .1936 .1954	.0389 .0388 .0390	.0048 .0053 .0108
1,000	37,000	a b c	.1945 .1993 .2064	.1544 .1545 .1560	.1937 .1935 .1952	.0393 .0390 .0392	.0008 .0058 .0112
1,000	38,000	a b c	.2012 .1985 .2069	.1551 .1539 .1562	.1941 .1929 .1952	.0390 .0390 .0390	.0071 .0056 .0117
10,300	48,300						Bar ruptured.

## No 54.—O. H. Steel Bar. Mark, 2.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10". Loaded and annealed in the same manner as test No. 53.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 50,000	0	0	<i>a</i>	<i>Inch.</i> .1992 .1995 .1994	<i>Inch.</i> .1615 .1618 .1617	<i>Inch.</i> .1989 .1992 .1990	<i>Inch.</i> .0374 .0374 .0373	<i>Inch.</i> .0003 .0003 .0004	
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.2043 .1969 .2027	.1581 .1565 .1582	.1962 .1949 .1961	.0381 .0384 .0379	.0081 .0050 .0066	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1946 .2096 .2043	.1528 .1544 .1552	.1912 .1930 .1937	.0384 .0386 .0385	.0032 .0166 .0106	
	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1990 .2115 .2044	.1514 .1536 .1533	.1902 .1923 .1918	.0388 .0387 .0385	.0088 .0192 .0126	
	1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.2055 .2124 .2044	.1506 .1529 .1518	.1896 .1917 .1906	.0390 .0388 .0386	.0159 .0207 .0138	
	1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2114 .1964 .2103	.1524 .1475 .1533	.1915 .1968 .1919	.0391 .0393 .0386	.0199 .0096 .0184	
	0	5,000	<i>a</i> <i>b</i> <i>c</i>	.1993 .1996 .2002	.1616 .1614 .1618	.1991 .1989 .1992	.0375 .0375 .0374	.0002 .0007 .0010	Bar rested 40 days.
	1,000	6,000	<i>a</i> <i>b</i> <i>c</i>	.2075 .2092 .2053	.1529 .1534 .1539	.1916 .1920 .1924	.0387 .0386 .0385	.0159 .0172 .0129	
	1,000	7,000	<i>a</i> <i>b</i> <i>c</i>	.1962 .1966 .2141	.1485 .1479 .1545	.1878 .1868 .1932	.0393 .0389 .0387	.0084 .0098 .0209	

1,000	8,000	a b c	2,130 2,092 2,071	.1513 .1519 .1518	.1906 .1906 .1907	.0393 .0387 .0389	.024 .0186 .0164
0	8,000	a b c	.2003 .1992 .1994	.1630 .1619 .1619	.2001 .1991 .1992	.0371 .0372 .0373	.0002 .0001 .0002
1,000	9,000	a b c	.1992 .1995 .2005	.1615 .1603 .1603	.1990 .1978 .1980	.0375 .0373 .0377	.0002 .0019 .0025
1,000	10,000	a b c	.2011 .2039 .2009	.1592 .1585 .1580	.1972 .1982 .1959	.0380 .0377 .0379	.0039 .0077 .0050
1,000	11,000	a b c	.2012 .2064 .2024	.1569 .1576 .1563	.1951 .1854 .1944	.0382 .0378 .0381	.0061 .0110 .0080
1,000	12,000	a b c	.1915 .2027 .2073	.1527 .1534 .1556	.1910 .1919 .1940	.0383 .0385 .0384	.0005 .0108 .0133
1,000	13,000	a b c	.2107 .2036 .2047	.1557 .1538 .1541	.1944 .1924 .1926	.0387 .0386 .0385	.0163 .0112 .0121
0	13,000	a b c	.2006 .1988 .1985	.1637 .1620 .1613	.2006 .1966 .1984	.0369 .0366 .0371	0. .0002 .0001
1,000	14,000	a b c	.2038 .1988 .2003	.1618 .1587 .1589	.1985 .1983 .1985	.0367 .0376 .0376	.0053 .0025 .0038
1,000	15,000	a b c	.2005 .2035 .2024	.1580 .1561 .1563	.1960 .1943 .1943	.0380 .0382 .0380	.0105 .0092 .0081
1,000	16,000	a b c	.2079 .1985 .2043	.1571 .1540 .1554	.1953 .1925 .1937	.0382 .0385 .0383	.0126 .0070 .0106
1,000	17,000	a b c	.1933 .2093 .2049	.1522 .1547 .1451	.1908 .1931 .1933	.0386 .0384 .0382	.0025 .0162 .0116

Heated at 500° F. in oil bath, and kept at that temperature for 1 hour; cooled slowly in oil bath; first annealing.

Bar annealed same manner as before at 500° F.; second annealing.

## No. 54.—O. H. Steel Bar. Mark, 2—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				Inch.	Inch.	Inch.	Inch.	Inch.	
	1,000	18,000	a	.1965	.1525	.1912	.0387	.0053	Bar annealed same manner as before at 500° F.; third annealing.
			b	.2101	.1550	.1933	.0383	.0168	
			c	.2043	.1543	.1928	.0385	.0115	
	0	18,000	a	.1998	.1625	.1997	.0372	.0001	Bar annealed same manner as before at 500° F.; third annealing.
			b	.1987	.1613	.1985	.0372	.0002	
			c	.2012	.1627	.2000	.0373	.0012	
	1,000	19,000	a	.2019	.1592	.1989	.0377	.0050	
			b	.1989	.1574	.1932	.0378	.0037	
			c	.2029	.1592	.1970	.0378	.0059	
	1,000	20,000	a	.2075	.1570	.1956	.0386	.0119	
			b	.2008	.1553	.1936	.0383	.0072	
			c	.1988	.1561	.1944	.0383	.0044	
	1,000	21,000	a	.2061	.1553	.1940	.0387	.0121	
			b	.1982	.1526	.1913	.0387	.0069	
			c	.2065	.1555	.1941	.0386	.0124	
	1,000	22,000	a	.1932	.1518	.1905	.0387	.0027	
			b	.2096	.1544	.1931	.0387	.0165	
			c	.2056	.1545	.1932	.0387	.0124	
	1,000	23,000	a	.1977	.1534	.1917	.0383	.0060	Bar annealed same manner as before at 500° F.; fourth annealing.
			b	.2103	.1562	.1935	.0383	.0168	
			c	.2038	.1541	.1926	.0385	.0112	
	0	23,000	a	.1993	.1618	.1992	.0374	.0001	
			b	.2005	.1634	.2003	.0369	.0002	
			c	.1989	.1613	.1986	.0373	.0003	
	1,000	24,000	a	.2006	.1580	.1959	.0379	.0047	
			b	.2045	.1568	.1966	.0378	.0079	
			c	.2014	.1579	.1958	.0379	.0056	
	1,000	25,000	a	.1953	.1544	.1929	.0385	.0024	
			b	.2086	.1542	.1925	.0383	.0161	
				.2070	.1564	.1947	.0383	.0123	

1,000	26,000	a	1,779	1,538	1,921	0.058
		b	.1861	.1625	.1910	.0383
		c	.2083	.1564	.1940	.0071
1,000	27,000	a	.1971	.1532	.1918	.0386
		b	.2097	.1556	.1940	.0053
		c	.2042	.1549	.1933	.0157
1,000	28,000	a	.2090	.1562	.1946	.0109
		b	.1992	.1530	.1914	.0384
		c	.2056	.1549	.1935	.0078
0	28,000	a	.2008	.1635	.2007	.0386
		b	.1987	.1613	.1985	.0121
		c	.1994	.1620	.1991	.0001
1,000	29,000	a	.2012	.1572	.1963	.0002
		b	.2055	.1568	.1949	.0372
		c	.2024	.1569	.1950	.0003
1,000	30,000	a	.2082	.1567	.1952	.0371
		b	.1999	.1542	.1927	.0059
		c	.2044	.1568	.1940	.0106
1,000	31,000	a	.1998	.1546	.1929	.0074
		b	.1982	.1524	.1906	.0385
		c	.2084	.1560	.1944	.0072
1,000	32,000	a	.1950	.1534	.1917	.0104
		b	.1982	.1522	.1907	.0383
		c	.2088	.1558	.1942	.0076
1,000	33,000	a	.1940	.1521	.1909	.0384
		b	.2097	.1548	.1933	.0033
		c	.2052	.1548	.1933	.0075
0	33,000	a	.1996	.1623	.1994	.0146
		b	.1999	.1627	.1997	.0388
		c	.1997	.1623	.1994	.0031
1,000	34,000	a	.1989	.1544	.1927	.0184
		b	.2066	.1566	.1947	.0385
		c	.2042	.1568	.1951	.0119
1,000	35,000	a	.2029	.1547	.1933	.0091
		b	.1979	.1525	.1911	.0386
		c	.2076	.1557	.1942	.0068

## No. 54.—O. H. Steel Bar. Mark, 2—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  Inch.	Seta.  Seta.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i>	1, 000	36, 000	<i>a</i> <i>b</i> <i>c</i>	<i>Inch.</i> .2069 .1986 .2065	<i>Inch.</i> .1550 .1534 .1561	<i>Inch.</i> .1939 .1917 .1943	<i>Inch.</i> .0389 .0383 .0382	<i>Inch.</i> .0130 .0069 .0122	
	1, 000	37, 000	<i>a</i> <i>b</i> <i>c</i>	.1955 .2099 .2048	.1526 .1550 .1546	.1913 .1936 .1933	.0387 .0386 .0387	.0042 .0163 .0115	
	1, 000	38, 000	<i>a</i> <i>b</i> <i>c</i>	.1920 .2102 .2360	.1508 .1544 .1549	.1898 .1930 .1934	.0390 .0386 .0385	.0022 .0172 .0126	
	6, 900	44, 900							Bar ruptured.

TEST No. 55.—*O. H. Steel from Rod No. 3.*

Shafts from rod No. 3 were each tested under 45,000 pounds per square inch maximum fiber stress.

The test of this shaft was continuous, excepting the intervals of time necessary to make observations upon its deflection and the permanent sets; also the shaft rested over night at the close of 50,000 rotations.

There was a gradual increase both in the maximum set and the total deflection. Thus we observe the maximum set ".0004 and the mean deflection ".0333 under the initial load, both of which values increased after the shaft had been running, and finally the last observations made prior to rupture gave the values ".0083 and ".0346 respectively.

## No. 55.—O. H. Steel Bar. Mark, 3.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 45,000	0	0	a	Inch. .1988 .2001 .2001	Inch. .1662 .1664 .1664	Inch. .1995 .1997 .1997	Inch. .0333 .0333 .0333	Inch. .0003 .0004 .0004	
	1,000	1,000	a b c	.2005 .2009 .2004	.1654 .1657 .1656	.1989 .1991 .1990	.0335 .0334 .0334	.0016 .0018 .0014	
	1,000	2,000	a b c	.2016 .2008 .2008	.1647 .1650 .1648	.1984 .1986 .1984	.0337 .0336 .0336	.0032 .0022 .0024	
	1,000	3,000	a b c	.1976 .2020 .2015	.1636 .1643 .1642	.1972 .1981 .1981	.0336 .0338 .0339	.0004 .0039 .0034	
	1,000	4,000	a b c	.1996 .1999 .2028	.1632 .1635 .1639	.1968 .1973 .1978	.0336 .0338 .0339	.0028 .0026 .0050	
	1,000	5,000	a b c	.1971 .2001 .2031	.1625 .1636 .1640	.1965 .1973 .1978	.0340 .0337 .0338	.0006 .0029 .0053	
	5,000	10,000	a b c	.2007 .1996 .2040	.1618 .1623 .1630	.1960 .1963 .1970	.0342 .0340 .0340	.0047 .0033 .0070	
	10,000	20,000	a b c	.2040 .2040 .2024	.1620 .1630 .1621	.1962 .1969 .1964	.0342 .0339 .0343	.0078 .0071 .0060	
	10,000	30,000	a b c	.2049 .2033 .2024	.1621 .1626 .1621	.1964 .1968 .1964	.0343 .0342 .0343	.0085 .0085 .0060	



10,000	40,000	a b c	.2024 .2051 .2025	.1815 .1626 .1619	.1958 .1968 .1961	.0343 .0342 .0342	.0066 .0083 .0064
10,000	50,000	a b c	.2049 .2039 .2027	.1620 .1624 .1616	.1961 .1967 .1961	.0341 .0343 .0345	.0088 .0072 .0066
10,000	60,000	a b c	.2014 .2048 .2025	.1610 .1624 .1618	.1956 .1968 .1961	.0346 .0344 .0343	.0058 .0080 .0064
10,000	70,000	a b c	.2005 .2055 .2022	.1615 .1627 .1615	.1956 .1970 .1960	.0341 .0343 .0345	.0049 .0085 .0062
10,000	80,000	a b c	.1931 .2021 .2053	.1589 .1614 .1621	.1935 .1939 .1965	.0346 .0345 .0344	.0004 .0062 .0088
10,000	90,000	a b c	.2047 .2003 .2028	.1616 .1614 .1613	.1961 .1960 .1958	.0345 .0346 .0345	.0086 .0043 .0070
10,000	100,000	a b c	.1931 .2033 .2040	.1580 .1608 .1610	.1926 .1953 .1956	.0346 .0345 .0346	.0005 .0080 .0084
10,000	110,000	a b c	.1964 .2053 .2029	.1592 .1616 .1613	.1944 .1961 .1959	.0352 .0345 .0346	.0020 .0092 .0070
10,000	120,000	a b c	.2041 .1996 .2032	.1612 .1610 .1611	.1958 .1955 .1959	.0346 .0345 .0348	.0083 .0041 .0073
7,500	127,500						

Bar ruptured.

TEST No. 56.—*O. H. steel from rod No. 3.*

Annealed six times at 500° F., at intervals of 10,000 rotations, the final annealing being done when 63,000 rotations were completed. After a further run of 53,900 rotations the shaft ruptured.

The effect of annealing on the magnitude of the sets was the same as recorded in previous tests.

## No. 56.—O. H. steel bar. Mark, 3.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds, 45,000	0	0	a	.1996	.1661	.1994	.0333	Inch.	Bar rested 39 days.
			b	.1996	.1660	.1994	.0334	.0002	
			c	.1998	.1662	.1994	.0332	.0002	
	1,000	1,000	a	.1988	.1650	.1985	.0335	.0003	
			b	.2003	.1653	.1989	.0336	.0014	
			c	.2003	.1653	.1988	.0335	.0015	
	1,000	2,000	a	.2010	.1647	.1984	.0337	.0036	
			b	.2001	.1650	.1986	.0336	.0019	
			c	.2007	.1650	.1985	.0335	.0022	
	1,000	3,000	a	.1976	.1636	.1974	.0338	.0002	
			b	.1997	.1643	.1980	.0337	.0017	
			c	.2016	.1647	.1988	.0336	.0033	
Pounds, 45,000	1,000	4,000	a	.1976	.1633	.1970	.0337	.0006	
			b	.2015	.1643	.1981	.0338	.0034	
			c	.2014	.1643	.1980	.0337	.0034	
	1,000	5,000	a	.1975	.1629	.1968	.0339	.0007	
			b	.1995	.1638	.1976	.0338	.0019	
			c	.2024	.1640	.1978	.0338	.0046	
	5,000	10,000	a	.2013	.1625	.1966	.0341	.0047	
			b	.1993	.1628	.1969	.0341	.0024	
			c	.2027	.1632	.1971	.0339	.0056	
	0	10,000	a	.2000	.1662	.1999	.0337	.0001	
			b	.1995	.1659	.1994	.0335	.0001	
			c	.1996	.1662	.1993	.0331	.0003	
Pounds, 45,000	1,000	11,000	a	.2010	.1641	.1974	.0333	.0036	
			b	.2018	.1645	.1981	.0336	.0037	
			c	.2011	.1642	.1978	.0336	.0043	

## No. 56.—O. H. steel bar. Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Remarks.		
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.	Deflections.		Sets.	
Pounds. 45,000	1,000	12,000	a b c	Inch. .1989 .2023 .2014	Inch. .1631 .1644 .1641	Inch. .1970 .1980 .1976	Inch. .0339 .0336 .0335	Inch. .0019 .0043 .0038	Bar heated in oil bath to 500° F., and kept at that temperature 1 hour; cooled slowly in oil bath, first annealing.	
	1,000	13,000	a b c	.1970 .1998 .2029	.1625 .1635 .1639	.1964 .1973 .1976	.0338 .0337 .0337	.0006 .0025 .0053		
	0	13,000	a b c	.2006 .1998 .1990	.1673 .1666 .1658	.2005 .1997 .1988	.0332 .0331 .0330	.0001 .0001 .0002		
	1,000	14,000	a b c	.2010 .2000 .1993	.1674 .1664 .1654	.2004 .1996 .1986	.0330 .0332 .0332	.0006 .0004 .0007		
	1,000	15,000	a b c	.2000 .1999 .1999	.1665 .1660 .1652	.1998 .1993 .1985	.0333 .0333 .0333	.0002 .0006 .0014		
	1,000	16,000	a b c	.2014 .2005 .1998	.1663 .1658 .1647	.1996 .1992 .1982	.0333 .0334 .0335	.0018 .0013 .0016		
	1,000	17,000	a b c	.2013 .2008 .2001	.1658 .1656 .1647	.1992 .1990 .1982	.0334 .0334 .0335	.0021 .0018 .0019		
	1,000	18,000	a b c	.1997 .1998 .2010	.1652 .1650 .1647	.1987 .1986 .1982	.0335 .0336 .0335	.0010 .0012 .0028		
	5,000	23,000	a b c	.2021 .2015 .2010	.1642 .1647 .1640	.1980 .1984 .1977	.0338 .0337 .0337	.0041 .0031 .0033		
	0	23,000	a b c	.2002 .1991 .1996	.1671 .1658 .1664	.2002 .1989 .1994	.0331 .0331 .0330	0. .0002 .0002		Bar annealed same manner as before at temperature of 500° F., second annealing.

Bar heated in oil bath to 500° F., and kept at that temperature 1 hour; cooled slowly in oil bath; first annealing.

Bar annealed same manner as before at temperature of 500° F.; second annealing.

Bar annealed same manner as before at temperature of 500 F.; third annealing.

1,000	24,000	a	2007	1696	1998	0009
		b	1993	1697	1999	0004
		c	1998	1698	1991	0007
1,000	25,000	a	1998	1658	1992	0006
		b	2000	1659	1988	0012
		c	2001	1665	1987	0011
1,000	26,000	a	2012	1655	1990	0022
		b	2003	1632	1987	0016
		c	2002	1648	1981	0018
1,000	27,000	a	2016	1654	1989	0027
		b	1998	1650	1986	0012
		c	2005	1648	1983	0022
1,000	28,000	a	2016	1652	1986	0030
		b	1997	1648	1984	0013
		c	2005	1645	1981	0024
5,000	33,000	a	2000	1659	1977	0023
		b	2016	1648	1984	0032
		c	2008	1641	1977	0031
0	33,000	a	1995	1663	1994	0001
		b	1998	1665	1996	0002
		c	1998	1668	1987	0001
1,000	34,000	a	1995	1656	1990	0005
		b	2005	1658	1993	0013
		c	2001	1655	1989	0012
1,000	35,000	a	1990	1650	1984	0006
		b	2009	1655	1989	0020
		c	2006	1650	1984	0022
1,000	36,000	a	2008	1647	1984	0024
		b	1998	1649	1985	0013
		c	2010	1647	1983	0027
1,000	37,000	a	2009	1647	1984	0025
		b	2013	1652	1987	0026
		c	2006	1643	1981	0025
1,000	38,000	a	2021	1648	1984	0037
		b	2005	1649	1985	0020
		c	2008	1643	1980	0028

## No. 56.—Ø. H. steel bar. Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 45,000	5,000	43,000	<i>a</i>	<i>Inch.</i> .2019 .2017 .2011	<i>Inch.</i> .1638 .1645 .1638	<i>Inch.</i> .1977 .1982 .1976	<i>Inch.</i> .0339 .0337 .0338	<i>Inch.</i> .0042 .0035 .0035	Bar annealed same manner as before at temperature of 500° F.; fourth annealing.
	0	43,000	<i>a</i> <i>b</i> <i>c</i>	.2002 .1995 .1996	.1671 .1661 .1662	.2001 .1994 .1994	.0330 .0333 .0332	.0001 .0001 .0002	
	1,000	44,000	<i>a</i> <i>b</i> <i>c</i>	.2013 .1999 .2000	.1661 .1659 .1662	.1994 .1990 .1986	.0333 .0331 .0334	.0019 .0009 .0014	
	1,000	45,000	<i>a</i> <i>b</i> <i>c</i>	.2018 .2001 .2003	.1656 .1654 .1648	.1990 .1988 .1982	.0334 .0334 .0334	.0028 .0013 .0021	
	1,000	46,000	<i>a</i> <i>b</i> <i>c</i>	.1987 .1998 .2013	.1649 .1650 .1644	.1983 .1985 .1982	.0334 .0335 .0338	.0004 .0013 .0031	
	1,000	47,000	<i>a</i> <i>b</i> <i>c</i>	.2011 .1997 .2011	.1652 .1647 .1645	.1985 .1984 .1980	.0333 .0337 .0335	.0026 .0013 .0031	
	1,000	48,000	<i>a</i> <i>b</i> <i>c</i>	.2006 .1998 .2012	.1648 .1646 .1642	.1983 .1983 .1979	.0335 .0337 .0337	.0023 .0035 .0033	
	5,000	53,000	<i>a</i> <i>b</i> <i>c</i>	.1982 .1997 .2021	.1638 .1640 .1641	.1973 .1979 .1978	.0335 .0339 .0337	.0009 .0018 .0043	
	0	53,000	<i>a</i> <i>b</i> <i>c</i>	.2005 .1995 .1995	.1675 .1661 .1664	.2004 .1994 .1995	.0329 .0333 .0331	.0001 .0001 0.	
	1,000	54,000	<i>a</i> <i>b</i> <i>c</i>	.1992 .1998 .2005	.1660 .1656 .1654	.1992 .1989 .1987	.0332 .0333 .0333	0. .0009 .0018	

Bar annealed same manner as before at 500° F.; fifth annealing.

Bar annealed same manner as before at 500° F.; sixth an nealing.

1,000	55,000	a	2001	1655	1989	0334	0012
1,000	56,000	a	2021	1656	1989	0333	0032
1,000	57,000	a	2001	1655	1987	0332	0014
1,000	58,000	a	2005	1647	1982	0335	0023
1,000	59,000	a	2010	1649	1986	0337	0024
1,000	60,000	a	2011	1653	1988	0335	0023
1,000	61,000	a	2006	1644	1981	0337	0025
1,000	62,000	a	2002	1645	1984	0339	0018
1,000	63,000	a	2015	1654	1987	0333	0028
1,000	64,000	a	2007	1645	1980	0335	0027
1,000	65,000	a	2025	1648	1982	0334	0043
1,000	66,000	a	2007	1647	1985	0338	0022
1,000	67,000	a	2008	1640	1975	0335	0033
1,000	68,000	a	2000	1668	1989	0331	0001
1,000	69,000	a	1999	1664	1988	0334	0001
1,000	70,000	a	1997	1663	1996	0333	0001
1,000	71,000	a	1989	1654	1988	0334	0001
1,000	72,000	a	2006	1658	1992	0334	0014
1,000	73,000	a	2006	1653	1987	0334	0019
1,000	74,000	a	2013	1651	1988	0337	0025
1,000	75,000	a	2010	1654	1990	0336	0020
1,000	76,000	a	2006	1646	1983	0337	0023
1,000	77,000	a	1990	1645	1983	0338	0007
1,000	78,000	a	2012	1651	1988	0337	0024
1,000	79,000	a	2009	1645	1983	0338	0026
1,000	80,000	a	2006	1646	1984	0338	0022
1,000	81,000	a	1999	1649	1984	0335	0015
1,000	82,000	a	2013	1645	1982	0337	0031
1,000	83,000	a	2012	1645	1984	0339	0028
1,000	84,000	a	2014	1649	1988	0339	0026
1,000	85,000	a	2008	1643	1980	0337	0028
48,900	116,900						

## No. 57.—O. H. steel bar. Mark, 3.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10". Duplicate of test No. 56. The surface of the middle bearing was badly scored during the test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Deflections.  Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.				
				Inch.	Inch.	Inch.				
Pounds. 45,000	0	0	a	.2002	.1661	.2000	.0339	Inch. .0002		
			b	.2002	.1663	.2000	.0337	.0002		
			c	.2001	.1663	.1999	.0336	.0002		
1,000	1,000	a	.2011	.1652	.1991	.0339	.0020			
		b	.2002	.1654	.1994	.0340	.0008			
		c	.2009	.1653	.1991	.0338	.0018			
1,000	2,000	a	.2018	.1644	.1984	.0340	.0034			
		b	.2002	.1648	.1989	.0341	.0013			
		c	.2014	.1647	.1988	.0331	.0026			
1,000	3,000	a	.1974	.1628	.1970	.0342	.0004			
		b	.2013	.1644	.1985	.0341	.0028			
		c	.2023	.1644	.1985	.0341	.0038			
1,000	4,000	a	.2022	.1631	.1974	.0343	.0048			
		b	.2023	.1643	.1984	.0341	.0039			
		c	.2019	.1638	.1981	.0343	.0038			
1,000	5,000	a	.2021	.1628	.1973	.0345	.0048			
		b	.2001	.1634	.1978	.0344	.0023			
		c	.2027	.1637	.1980	.0343	.0047			
5,000	10,000	a	.1966	.1607	.1953	.0346	.0013	Bar rested 38 days.		
		b	.2041	.1630	.1974	.0344	.0067			
		c	.2030	.1627	.1972	.0345	.0058			
0	10,000	a	.2006	.1671	.2005	.0354	.0001			
		b	.2006	.1668	.2002	.0354	.0004			
		c	.1997	.1655	.1992	.0357	.0005			
1,000	11,000	a	.2036	.1638	.1979	.0341	.0057			
		b	.2008	.1643	.1982	.0359	.0026			
		c	.2022	.1642	.1980	.0358	.0042			



Bar heated in oil bath to 500° F., and kept at that temperature 1 hour; cooled slowly in oil bath; first annealing.

Bar annealed same manner as before at temperature of 500° F.; second annealing.

1,000	12,000	a	.2029 .2030 .2023	.1631 .1641 .1637	.1972 .1977	.0341 .0339 .0340	.0057 .0048 .0046
1,000	13,000	a b c	.1977 .2038 .2027	.1650 .1639 .1635	.1963 .1980 .1976	.0343 .0341 .0341	.0014 .0058 .0051
0	13,000	a b c	.2010 .2000 .2001	.1676 .1665 .1664	.2008 .1998 .1998	.0332 .0333 .0334	.0002 .0002 .0003
1,000	14,000	a	.2013 .2002 .2004	.1670 .1664 .1663	.2006 .1998 .1998	.0336 .0334 .0335	.0007 .0004 .0006
1,000	15,000	a b c	.2005 .2001 .2008	.1664 .1659 .1659	.2000 .1995 .1995	.0336 .0336 .0336	.0005 .0006 .0013
1,000	16,000	a b c	.2013 .2003 .2008	.1660 .1659 .1656	.1998 .1995 .1992	.0338 .0336 .0336	.0015 .0014 .0016
1,000	17,000	a b c	.2000 .2002 .2014	.1655 .1653 .1654	.1992 .1992 .1991	.0338 .0339 .0337	.0007 .0010 .0028
1,000	18,000	a b c	.2019 .2004 .2012	.1654 .1654 .1652	.1694 .1991 .1990	.0340 .0337 .0338	.0025 .0013 .0022
5,000	23,000	a b c	.1985 .2004 .2024	.1640 .1646 .1645	.1980 .1985 .1986	.0340 .0339 .0341	.0005 .0018 .0038
0	23,000	a b c	.2004 .2001 .1939	.1669 .1667 .1665	.2004 .1999 .1997	.0335 .0332 .0332	0. .0002 .0002
1,000	24,000	a b c	.2010 .2001 .2002	.1666 .1666 .1660	.2000 .1998 .1995	.0334 .0332 .0335	.0010 .0003 .0007
1,000	25,000	a b c	.1994 .2004 .2007	.1656 .1662 .1658	.1993 .1995 .1992	.0337 .0333 .0334	.0001 .0009 .0005
1,000	26,000	a b c	.2003 .2010 .2007	.1654 .1658 .1654	.1992 .1994 .1990	.0338 .0336 .0336	.0010 .0016 .0017

No. 57.—O. H. steel bar.—Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 45,000	1,000	27,000	<i>a</i>	<i>Inch.</i> .1995	<i>Inch.</i> .1654	<i>Inch.</i> .1987	<i>Inch.</i> .0333	<i>Inch.</i> .0008	Bar annealed same manner as before, at temperature of 500° F.; third annealing.
			<i>b</i>	.2001	.1653	.1991	.0338	.0010	
			<i>c</i>	.2013	.1650	.1988	.0358	.0025	
	1,000	28,000	<i>a</i>	.2013	.1650	.1988	.0358	.0025	
			<i>b</i>	.2013	.1653	.1991	.0338	.0022	
			<i>c</i>	.2009	.1648	.1986	.0338	.0023	
	5,000	33,000	<i>a</i>	.1981	.1637	.1979	.0342	.0002	
			<i>b</i>	.2003	.1648	.1985	.0337	.0018	
			<i>c</i>	.2020	.1645	.1984	.0339	.0036	
	0	33,000	<i>a</i>	.2008	.1674	.2007	.0333	.0001	
			<i>b</i>	.1997	.1664	.1995	.0331	.0002	
			<i>c</i>	.2002	.1664	.2000	.0336	.0002	
	1,000	34,000	<i>a</i>	.2015	.1664	.1999	.0335	.0016	
			<i>b</i>	.2000	.1658	.1994	.0336	.0006	
			<i>c</i>	.2007	.1658	.1994	.0336	.0003	
	1,000	35,000	<i>a</i>	.2021	.1658	.1995	.0337	.0026	
			<i>b</i>	.2005	.1655	.1993	.0338	.0012	
			<i>c</i>	.2008	.1653	.1990	.0337	.0018	
	1,000	36,000	<i>a</i>	.2013	.1654	.1991	.0337	.0022	
			<i>b</i>	.2001	.1653	.1990	.0337	.0011	
			<i>c</i>	.2013	.1648	.1988	.0340	.0025	
	1,000	37,000	<i>a</i>	.2009	.1649	.1988	.0339	.0021	
			<i>b</i>	.2002	.1653	.1989	.0336	.0013	
			<i>c</i>	.2015	.1651	.1983	.0337	.0027	
	1,000	38,000	<i>a</i>	.2006	.1649	.1987	.0338	.0019	
			<i>b</i>	.2016	.1655	.1991	.0336	.0025	
			<i>c</i>	.2012	.1648	.1987	.0339	.0025	
	5,000	43,000	<i>a</i>	.2028	.1645	.1987	.0342	.0041	
			<i>b</i>	.2007	.1650	.1989	.0339	.0018	
			<i>c</i>	.2015	.1644	.1985	.0341	.0030	

Bar annealed same manner as before, at temperature of 500°  
F., fourth annealing.

0	43,000	a b c	.2005* .1999 .2002	.1670 .1664 .1667	.2005 .1998 .2000	.0335 .0334 .0333	0. .0001 .0002
1,000	44,000	a b c	.2015 .2002 .2007	.1665 .1662 .1660	.1999 .1995 .1995	.0334 .0333 .0335	.0016 .0007 .0012
1,000	45,000	a b c	.2020 .2008 .2008	.1659 .1658 .1655	.1905 .1903 .1992	.0336 .0335 .0357	.0025 .0015 .0016
1,000	46,000	a b c	.1989 .2013 .2013	.1650 .1654 .1653	.1987 .1982 .1990	.0337 .0338 .0337	.0002 .0021 .0023
1,000	47,000	a b c	.1990 .2004 .2013	.1649 .1653 .1650	.1988 .1990 .1989	.0339 .0337 .0339	.0002 .0014 .0024
1,000	48,000	a b c	.2002 .2003 .2018	.1648 .1650 .1651	.1986 .1988 .1989	.0338 .0332 .0338	.0016 .0015 .0029
5,000	53,000	a b c	.1984 .2018 .2018	.1641 .1651 .1648	.1980 .1989 .1987	.0339 .0338 .0339	.0004 .0029 .0031
0	53,000	a b c	.2008 .2001 .2000	.1675 .1665 .1664	.2008 .2000 .1998	.0333 .0335 .0334	0. .0001 .0002
1,000	54,000	a b c	.2018 .2004 .2006	.1664 .1663 .1659	.1999 .1987 .1993	.0335 .0324 .0334	.0019 .0017 .0013
1,000	55,000	a b c	.2020 .2005 .2009	.1661 .1659 .1654	.1996 .1994 .1990	.0335 .0335 .0336	.0024 .0011 .0011
1,000	56,000	a b c	.2021 .2013 .2010	.1655 .1657 .1653	.1992 .1994 .1989	.0337 .0337 .0336	.0029 .0019 .0021
1,000	57,000	a b c	.1988 .2013 .2018	.1647 .1657 .1652	.1985 .1991 .1989	.0338 .0334 .0337	.0003 .0024 .0027

Bar annealed same manner as before, at temperature of 500°  
F., fifth annealing.

0	53,000	a b c	.2008 .2001 .2000	.1675 .1665 .1664	.2008 .2000 .1998	.0333 .0335 .0334	0. .0001 .0002
1,000	54,000	a b c	.2018 .2004 .2006	.1664 .1663 .1659	.1999 .1987 .1993	.0335 .0324 .0334	.0019 .0017 .0013
1,000	55,000	a b c	.2020 .2005 .2009	.1661 .1659 .1654	.1996 .1994 .1990	.0335 .0335 .0336	.0024 .0011 .0011
1,000	56,000	a b c	.2021 .2013 .2010	.1655 .1657 .1653	.1992 .1994 .1989	.0337 .0337 .0336	.0029 .0019 .0021
1,000	57,000	a b c	.1988 .2013 .2018	.1647 .1657 .1652	.1985 .1991 .1989	.0338 .0334 .0337	.0003 .0024 .0027



TEST No. 58.—*O. H. steel from rod No. 3.*

Annealed six times at intervals of 5,000 rotations, the final annealing being done upon the completion of 33,000 rotations.

Observations on deflections and sets were made up to 38,000 rotations, after which the run was continuous until the shaft ruptured.

No. 58.—O. H. steel bar Mark, 3.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 0'.33. Deflections measured on chord of 10".

Number of rotations. Micrometer readings for deflections.

Pounds. 45,000	Successive.	Total.	On line.	Unloaded.		Loaded.		Unloaded.		Deflections.		Sets.	Remarks.
				Inch.		Inch.		Inch.		Inch.			
0	0	0	a b c	.2008		.1675		.2006		.0331		Inch. .0002	
				.2010		.1675		.2008		.0333		.0002	
				.2009		.1674		.2006		.0332		.0003	
1,000	1,000	1,000	a b c	.2012		.1668		.2002		.0334		.0010	
				.2016		.1667		.2001		.0334		.0015	
				.2013		.1668		.2001		.0333		.0012	
1,000	1,000	2,000	a b c	.2022		.1664		.1999		.0335		.0023	
				.2010		.1680		.1995		.0335		.0015	
				.2019		.1682		.1998		.0336		.0021	
1,000	1,000	3,000	a b c	.2028		.1681		.1996		.0335		.0032	
				.2011		.1682		.1990		.0338		.0027	
				.2021		.1689		.1994		.0335		.0027	
1,000	1,000	4,000	a b c	.2012		.1150		.1888		.0338		.0024	
				.2008		.1642		.1880		.0338		.0028	
				.2034		.1654		.1891		.0337		.0043	
1,000	1,000	5,000	a b c	.2024		.1650		.1888		.0338		.0036	
				.2009		.1640		.1979		.0339		.0030	
				.2034		.1653		.1989		.0336		.0045	
0	0	5,000	a b c	.2018		.1684		.2015		.0331		.0003	Bar rested 39 days.
				.2009		.1674		.2004		.0330		.0005	
				.2008		.1671		.2003		.0332		.0005	
1,000	1,000	6,000	a b c	.2027		.1653		.1992		.0334		.0035	
				.2033		.1654		.1989		.0335		.0044	
				.2023		.1658		.1992		.0334		.0031	
1,000	1,000	7,000	a b c	.2003		.1649		.1985		.0336		.0018	
				.2009		.1643		.1980		.0337		.0029	
				.2058		.1688		.1991		.0333		.0047	

1,000	8,000	a b c	2046 2022 2029	1657 1647 1653	1992 1984 1988	.0335 .0327 .0335	.0054 0.0038 0.0041
0	8,000	a b c	.2012 .2012 .2010	.1680 .1680 .1679	.2011 .2010 .2006	.0331 .0330 .0329	.0001 0.0002 0.0002
1,000	9,000	a b c	.2015 .2013 .2011	.1678 .1676 .1675	.2009 .2008 .2005	.0331 .0332 .0330	.0006 0.0005 0.0006
1,000	10,000	a b c	.2016 .2020 .2013	.1673 .1671 .1669	.2006 .2004 .2003	.0333 .0333 .0334	.0010 0.0016 0.0010
1,000	11,000	a b c	.2027 .2017 .2016	.1672 .1666 .1670	.2005 .2000 .2001	.0333 .0334 .0331	.0022 0.0017 0.0015
1,000	12,000	a b c	.1996 .2027 .2020	.1681 .1684 .1685	.1995 .1997 .1999	.0334 .0333 .0334	.0001 0.0030 0.0021
1,000	13,000	a b c	.2019 .2030 .2018	.1682 .1680 .1665	.1998 .1995 .1996	.0336 .0335 .0333	.0021 0.0035 0.0020
0	13,000	a b c	.2018 .2004 .2005	.1687 .1673 .1676	.2018 .2002 .2004	.0331 .0329 .0328	0. 0.0002 0.0001
1,000	14,000	a b c	.2020 .2008 .2009	.1679 .1668 .1672	.2011 .1999 .2003	.0332 .0331 .0331	.0009 0.0009 0.0006
1,000	15,000	a b c	.2013 .2009 .2016	.1670 .1682 .1668	.2004 .1996 .2000	.0334 .0334 .0332	.0009 0.0013 0.0016
1,000	16,000	a b c	.2016 .2022 .2014	.1667 .1682 .1665	.2000 .1997 .1998	.0333 .0335 .0332	.0016 0.0025 0.0016
1,000	17,000	a b c	.2002 .2012 .2021	.1663 .1662 .1665	.1998 .1994 .1998	.0335 .0332 .0333	.0004 0.0018 0.0023

Bar heated in oil bath to 500° F., and kept at that temperature 1 hour; cooled slowly in oil bath; first annealing.

Bar annealed same manner as before, at temperature of 500° F.; second annealing.

## No. 58.—O. H. steel bar. Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 45,000	1,000	18,000	a	Inch. .2027 .2019 .2017	Inch. .1664 .1660 .1663	Inch. .1999 .1994 .1996	Inch. .0335 .0334 .0333	Inch. .0028 .0025 .0021	Bar annealed same manner as before, at temperature of 500° F.; third annealing.
	0	18,000	a b c	.2014 .2005 .2019	.1681 .1673 .1678	.2013 .2004 .2008	.0332 .0331 .0330	.0001 .0001 .0002	
	1,000	19,000	a b c	.2021 .2012 .2012	.1675 .1666 .1671	.2007 .2000 .2003	.0332 .0334 .0332	.0014 .0012 .0009	
	1,000	20,000	a b c	.2018 .2020 .2013	.1669 .1664 .1667	.2002 .1998 .2000	.0333 .0334 .0333	.0016 .0022 .0013	
	1,000	21,000	a b c	.2028 .2014 .2016	.1669 .1662 .1665	.2004 .1996 .1998	.0335 .0334 .0333	.0024 .0018 .0018	
	1,000	22,000	a b c	.1998 .1927 .2019	.1661 .1660 .1665	.1995 .1994 .1998	.0334 .0334 .0333	.0003 .0003 .0021	
	1,000	23,000	a b c	.1995 .2028 .2019	.1655 .1659 .1662	.1992 .1994 .1997	.0337 .0335 .0335	.0003 .0004 .0022	
	0	23,000	a b c	.2014 .2010 .2008	.1682 .1680 .1678	.2012 .2008 .2007	.0330 .0328 .0329	.0002 .0002 .0001	
	1,000	24,000	a b c	.2005 .2011 .2016	.1671 .1667 .1670	.2004 .1999 .2002	.0333 .0332 .0332	.0001 .0013 .0014	
	1,000	25,000	a b c	.2022 .2019 .2014	.1668 .1665 .1668	.2002 .2002 .1999	.0334 .0333 .0331	.0017 .0024 .0015	

Bar annealed same manner as before, at temperature of 500° F.; fourth annealing.



Bar annealed same manner as before, at temperature of 500°  
F., fifth annealing.

Bar annealed same manner as before, at temperature of 500°  
F.; sixth annealing.

1,000	26,000	a	.2021	.1667	.2001	.0334	.0020
		b	.2011	.1659	.1994	.0335	.0017
		c	.2020	.1667	.1999	.0332	.0021
1,000	27,000	a	.2007	.1664	.1997	.0333	.0010
		b	.2028	.1662	.1996	.0334	.0032
		c	.2016	.1665	.1997	.0332	.0019
1,000	28,000	a	.1998	.1658	.1994	.0336	.0004
		b	.2031	.1661	.1995	.0334	.0036
		c	.2016	.1663	.1998	.0335	.0018
0	28,000	a	.2014	.1684	.2014	.0330	0.
		b	.2011	.1680	.2011	.0331	0.
		c	.2006	.1676	.2004	.0328	.0002
1,000	29,000	a	.2007	.1674	.2003	.0329	.0004
		b	.2022	.1669	.2000	.0331	.0022
		c	.2011	.1670	.2000	.0330	.0011
1,000	30,000	a	.2021	.1673	.2002	.0329	.0019
		b	.2012	.1662	.1996	.0334	.0016
		c	.2017	.1665	.1999	.0334	.0018
1,000	31,000	a	.2022	.1669	.2000	.0331	.0022
		b	.2013	.1661	.1994	.0333	.0019
		c	.2021	.1666	.1999	.0333	.0022
1,000	32,000	a	.2030	.1669	.2002	.0333	.0028
		b	.2021	.1662	.1996	.0334	.0025
		c	.2017	.1664	.1997	.0333	.0020
1,000	33,000	a	.2029	.1667	.2001	.0334	.0028
		b	.2014	.1658	.1994	.0336	.0020
		c	.2018	.1666	.1998	.0332	.0020
0	33,000	a	.2013	.1681	.2013	.0332	0.
		b	.2013	.1679	.2011	.0332	.0002
		c	.2008	.1676	.2006	.0330	.0002
1,000	34,000	a	.2006	.1668	.2002	.0334	.0004
		b	.2025	.1665	.2000	.0335	.0025
		c	.2015	.1668	.2001	.0333	.0014
1,000	35,000	a	.2000	.1662	.1997	.0335	.0003
		b	.2027	.1662	.1998	.0336	.0029
		c	.2018	.1665	.1999	.0334	.0019



## No. 59.—O. H. steel bar. Mark, 3.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10". Duplicate of test No. 58.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 45,000	0	0		Inch. .2006 .2005 .2009	Inch. .1879 .1869 .1871	Inch. .2005 .2003 .2007	Inch. .0326 .0314 .0336	Inch. .0001 .0002 .0002	
	1,000	1,000		.2015 .2004 .2017	.1864 .1856 .1865	.2000 .1985 .2002	.0336 .0339 .0337	.0015 .0009 .0015	
	1,000	2,000		.2016 .2020 .2022	.1855 .1852 .1858	.1998 .1991 .1996	.0338 .0339 .0338	.0023 .0029 .0026	
	1,000	3,000		.1889 .2030 .2027	.1843 .1846 .1853	.1984 .1987 .1994	.0341 .0341 .0341	.0005 .0043 .0033	
	1,000	4,000		.2001 .2034 .2026	.1843 .1844 .1851	.1988 .1985 .1991	.0340 .0341 .0340	.0018 .0049 .0035	
	1,000	5,000		.1908 .2038 .2030	.1839 .1840 .1847	.1980 .1983 .1988	.0341 .0343 .0341	.0018 .0053 .0042	
	0	5,000		.2010 .2011 .2007	.1876 .1873 .1868	.2008 .2004 .2001	.0332 .0331 .0333	.0002 .0007 .0006	Bar rested 39 days.
	1,000	6,000		.2002 .2035 .2028	.1848 .1851 .1852	.1985 .1987 .1991	.0337 .0336 .0339	.0017 .0048 .0037	
	1,000	7,000		.2085 .2010 .2030	.1849 .1845 .1853	.1988 .1983 .1990	.0339 .0338 .0337	.0047 .0027 .0040	

## No. 59.—O. H. steel bar. Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 45,000	1,000	8,000	a b c	Inch. .1982 .2006 .2042	Inch. .1639 .1639 .1646	Inch. .1978 .1978 .1988	Inch. .0349 .0004 .0028 .0054		Bar heated in oil bath to 500° F. and kept at that temperature 1 hour; cooled slowly in oil bath; first annealing.
	0	8,000	a b c	.2012 .2012 .2004	.1678 .1680 .1671	.2010 .2011 .2003	.0002 .0001 .0001 .0001		
	1,000	9,000	a b c	.2012 .2015 .2007	.1675 .1675 .1669	.2008 .2008 .2002	.0004 .0007 .0005		
	1,000	10,000	a b c	.2016 .2015 .2011	.1672 .1669 .1665	.2006 .2005 .1999	.0010 .0010 .0012		
	1,000	11,000	a b c	.2014 .2020 .2013	.1669 .1666 .1663	.2003 .2002 .1998	.0011 .0018 .0015		
	1,000	12,000	a b c	.2004 .2008 .2020	.1664 .1663 .1661	.2000 .1997 .1997	.0004 .0011 .0023		
	1,000	13,000	a b c	.2023 .2017 .2017	.1667 .1662 .1658	.2002 .1997 .1995	.0021 .0020 .0022		
	0	13,000	a b c	.2010 .2007 .2001	.1676 .1674 .1670	.2009 .2006 .2000	.0001 .0001 .0001		
	1,000	14,000	a b c	.2012 .2006 .2006	.1674 .1668 .1666	.2007 .2003 .1999	.0005 .0003 .0007		

Bar annealed same manner as before at temperature of 500° F.; second annealing.

1,000	15,000	$\alpha$	.2004	.1669	.2003	.0334	.0001
		$b$	.2006	.1664	.1999	.0335	.0007
		$c$	.2012	.1662	.1997	.0335	.0015
1,000	16,000	$a$	.2018	.1668	.2003	.0335	.0015
		$b$	.2009	.1662	.1999	.0337	.0010
		$c$	.2012	.1663	.1996	.0333	.0016
1,000	17,000	$a$	.2010	.1664	.1999	.0335	.0011
		$b$	.2005	.1659	.1994	.0335	.0011
		$c$	.2017	.1658	.1996	.0338	.0021
1,000	18,000	$a$	.1996	.1658	.1905	.0337	.0001
		$b$	.2015	.1659	.1904	.0335	.0021
		$c$	.2017	.1661	.1904	.0333	.0023
0	18,000	$a$	.2015	.1662	.2014	.0332	.0001
		$b$	.2010	.1670	.2007	.0331	.0003
		$c$	.1997	.1662	.1995	.0333	.0002
1,000	19,000	$a$	.2014	.1675	.2008	.0333	.0006
		$b$	.2007	.1667	.2001	.0334	.0006
		$c$	.2008	.1663	.1995	.0332	.0013
1,000	20,000	$a$	.2019	.1671	.2005	.0334	.0014
		$b$	.2008	.1664	.1999	.0335	.0009
		$c$	.2011	.1659	.1996	.0337	.0015
1,000	21,000	$a$	.2019	.1668	.2003	.0335	.0016
		$b$	.2016	.1664	.1998	.0334	.0018
		$c$	.2012	.1661	.1995	.0334	.0017
1,000	22,000	$a$	.2015	.1663	.1999	.0336	.0016
		$b$	.2020	.1662	.1997	.0335	.0023
		$c$	.2014	.1656	.1994	.0338	.0020
1,000	23,000	$a$	.2008	.1662	.1997	.0335	.0011
		$b$	.2005	.1657	.1993	.0336	.0012
		$c$	.2021	.1659	.1994	.0335	.0027
0	23,000	$a$	.2009	.1677	.2009	.0332	0.
		$b$	.2006	.1673	.2005	.0332	.0001
		$c$	.2008	.1675	.2005	.0330	.0003
1,000	24,000	$a$	.2016	.1674	.2006	.0332	.0010
		$b$	.2009	.1666	.2001	.0335	.0008
		$c$	.2012	.1666	.2001	.0335	.0011

Bar annealed same manner as before at temperature of 500°  
F.; third annealing.

Bar annealed same manner as before at temperature of 500°  
F.; fourth annealing.

## No. 59.—O. H. steel bar. Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 45,000	1,000	25,000	a	Inch. .2019	Inch. .1670	Inch. .2005	Inch. .0335	Inch. .0014	Bar annealed same manner as before at temperature of 500° F.; fifth annealing.
			b	.2010	.1663	.1999	.0336	.0011	
			c	.2013	.1665	.1998	.0338	.0015	
	1,000	26,000	a	.2016	.1666	.2000	.0334	.0016	
			b	.2018	.1661	.1998	.0337	.0020	
			c	.2014	.1664	.1997	.0333	.0017	
	1,000	27,000	a	.2013	.1663	.1999	.0336	.0014	
			b	.2021	.1659	.1998	.0023	.0023	
			c	.2016	.1660	.1996	.0336	.0020	
	1,000	28,000	a	.2022	.1665	.2001	.0336	.0021	
			b	.2015	.1662	.1998	.0336	.0017	
			c	.2016	.1660	.1995	.0335	.0021	
	0	28,000	a	.2014	.1679	.2012	.0333	.0062	Bar annealed same manner as before at temperature of 500° F.; sixth annealing.
			b	.2007	.1676	.2006	.0330	.0001	
			c	.2006	.1670	.2004	.0334	.0002	
	1,000	29,000	a	.2005	.1670	.2004	.0334	.0001	
			b	.2011	.1665	.2000	.0335	.0011	
			c	.2014	.1667	.2000	.0333	.0014	
	1,000	30,000	a	.2021	.1670	.2005	.0335	.0016	
			b	.2010	.1664	.1999	.0335	.0011	
			c	.2014	.1664	.1998	.0334	.0016	
	1,000	31,000	a	.2022	.1663	.2003	.0335	.0019	
			b	.2012	.1662	.1999	.0337	.0013	
			c	.2016	.1663	.1997	.0334	.0019	
	1,000	32,000	a	.2021	.1666	.2001	.0335	.0020	Bar annealed same manner as before at temperature of 500° F.; sixth annealing.
			b	.2017	.1661	.1998	.0337	.0019	
			c	.2015	.1660	.1996	.0336	.0019	
	1,000	33,000	a	.2018	.1662	.1999	.0337	.0019	
			b	.2022	.1661	.1997	.0336	.0025	
			c	.2016	.1659	.1996	.0337	.0020	

0	33,000	a b c	2006 2007 2009	.1677 .1672 .1672	2010 2006 2007	.0333 .0334 .0335	0. 0. .0002
1,000	34,000	a b c	2004 2016 2015	.1666 .1664 .1664	2002 2000 2001	.0336 .0336 .0337	.0002 .0016 .0014
1,000	35,000	a b c	2003 2009 2019	.1664 .1660 .1660	2001 1997 2000	.0337 .0337 .0340	.0002 .0012 .0019
1,000	36,000	a b c	2015 2007 2020	.1664 .1657 .1660	2002 1996 1999	.0338 .0339 .0339	.0013 .0011 .0021
1,000	37,000	a b c	2011 2008 2022	.1661 .1657 .1658	2000 1995 1997	.0339 .0338 .0339	.0011 .0013 .0025
1,000	38,000	a b c	1996 2018 2022	.1656 .1657 .1658	1995 1996 1998	.0339 .0339 .0340	.0001 .0022 .0024
41,850	79,850						Bar ruptured.

TEST No. 70.—*O. H. steel from rod No. 4.*

Shafts from rod No. 4 were all run under the same maximum fiber stress, 45,000 pounds per square inch.

A moderate heating of the shaft accompanies stresses which cause decided permanent sets, the metal in the vicinity of the middle bearing attaining temperatures from 100° F. upward, according to the magnitude of the sets and the speed of rotation.

When no mention is made of the temperature the heating was moderate, perceptible to the touch, and ranging from atmospheric temperature to about 120° F.

This shaft acquired a moderate temperature while running, perceptible to the touch.

Micrometer observations were made up to the time of reaching 10,000 rotations, after which the testing was continuous until the shaft was ruptured.



No. 70.—O. H. steel bar. *Mark, 4.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 45,000	0	0	<i>Inch.</i> a b c	<i>Inch.</i> .1998 .1999 .1999	<i>Inch.</i> .1649 .1651 .1651	<i>Inch.</i> .1995 .1996 .1996	<i>Inch.</i> .0346 .0345 .0345	<i>Inch.</i> .0003 .0003 .0003	
	1,000	1,000	a b c	.2015 .2029 .2017	.1615 .1629 .1629	.1962 .1978 .1977	.0347 .0349 .0348	.0053 .0051 .0040	
	1,000	2,000	a b c	.1993 .2048 .2023	.1601 .1617 .1615	.1950 .1968 .1965	.0349 .0351 .0350	.0043 .0080 .0053	
	1,000	3,000	a b c	.2045 .2001 .2039	.1603 .1604 .1613	.1954 .1957 .1963	.0351 .0353 .0350	.0091 .0044 .0076	
	2,000	5,000	a b c	.1929 .2044 .2055	.1558 .1601 .1611	.1919 .1854 .1962	.0351 .0353 .0371	.0010 .0080 .0093	
	5,000	10,000	a b c	.1947 .2073 .2046	.1566 .1589 .1603	.1925 .1955 .1956	.0359 .0356 .0353	.0022 .0118 .0090	
	42,900	52,900							Bar ruptured.



TEST No. 72.—*O. H. steel from rod No. 4.*

No micrometer observations made.

The shaft was initially heated to the temperature of 120° F., approximately.

The temperature increased during the continuance of the test, and at the time of rupture had reached about 180° F.

The shaft ruptured at 50,000 rotations, under the maximum fiber stress of 45,000 pounds per square inch.



Tests Nos. 103 to 106, inclusive, were shafts from O. H. steel rod No. 4a.

They were run at a speed of 2,200 rotations per minute, all working under the same fiber stress, 45,000 pounds per square inch.

Test No. 103 was begun with the shaft cold, but allowed to increase in temperature, due to the sets which the metal received and the high rate of speed at which it was driven.

Judging from the color of the cylindrical surface at the middle bearing after the test, which was a purple, the temperature rose to about 500° F.

Rupture occurred at 46,200 rotations.

Nos. 104 and 105 were tested cold, a stream of water being played on them at the middle bearing during the tests.

They ruptured at 58,000 and 54,000 rotations respectively.

No. 106 was initially heated by means of a gas-burner until it was blue, the estimated temperature being 600° F.

The gas was turned off when the test began, the temperature after this being maintained by reason of the rapid rotations under loads which caused sets.

Rupture occurred at 57,000 rotations.

#### TEST No. 74.—*O. H. steel from rod No. 5.*

Under 45,000 pounds per square inch, maximum fiber stress, 2,000 rotations were made, then the load was increased to 48,000 pounds per square inch, and maintained for the remainder of the test.

The other shafts from rod No. 5, were run under the latter stress.

A stream of cold water flowed continually over the middle bearing of this shaft during the test, keeping the temperature at about 65° F.

No. 74.—*O. H. steel bar. Mark, 5.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflection.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 45,000	0	0	<i>a</i>	<i>Inch.</i> .1899 .1977 .2000	<i>Inch.</i> .1665 .1681 .1662	<i>Inch.</i> .1997 .1995 .1996	<i>Inch.</i> .0332 .0334 .0334	<i>Inch.</i> .0002 .0002 .0004	Stream of cold water played on bar continually during the test.
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.1994 .1998 .2004	.1666 .1660 .1659	.1993 .1994 .1994	.0337 .0334 .0335	.0001 .0004 .0010	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.2008 .2003 .2004	.1656 .1656 .1654	.1991 .1992 .1991	.0335 .0336 .0337	.0017 .0011 .0013	
	0	2,000	<i>a</i> <i>b</i> <i>c</i>	.2005 .2002 .2005	.1629 .1631 .1631	.1990 .1991 .1990	.0361 .0360 .0359	.0015 .0011 .0015	
	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1984 .2018 .2015	.1610 .1620 .1620	.1972 .1982 .1983	.0362 .0362 .0363	.0012 .0036 .0032	
	1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.2019 .2025 .2017	.1607 .1612 .1613	.1970 .1977 .1976	.0363 .0365 .0363	.0049 .0048 .0041	
	1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2012 .1992 .2035	.1603 .1585 .1606	.1965 .1961 .1973	.0362 .0366 .0365	.0047 .0031 .0062	
	47,800	52,800							Bar ruptured.

TEST No. 75.—*O. H. steel from rod No. 5.*

The shaft was initially heated by means of a gas-burner to about 150° F., then measured while hot, after which the temperature was increased to about 180° F. and kept there during the test.

## No. 75.—O. H. steel bar. Mark, 5.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 48,000	0	0	<i>a</i> <i>b</i> <i>c</i>	<i>Inch.</i> .2002 .2005 .2005	<i>Inch.</i> .1641 .1645 .1645	<i>Inch.</i> .2000 .2001 .2002	<i>Inch.</i> .0002 .0359 .0004 .0003 .0357		
	0	0	<i>a</i> <i>b</i> <i>c</i>	.1997 .2003 .2004	.1628 .1638 .1640	.1997 .2001 .2001	.0369 .0363 .0361	0. .0002 .0003	Bar heated to about 150° F. by means of gas-burners. Measurements while hot. Temperature of bar brought up to about 180° F. and maintained through the test.
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.1959 .2053 .2009	.1586 .1642 .1623	.1960 .2008 .1989	.0374 .0366 .0366	— .0001 .0045 .0020	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.2074 .1947 .2032	.1641 .1559 .1630	.2019 .1928 .1996	.0378 .0369 .0366	.0055 .0019 .0036	
	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1878 .2029 .2089	.1504 .1623 .1674	.1882 .1994 .2040	.0378 .0371 .0366	— .0004 .0035 .0049	
29,850	29,850	32,850							Bar ruptured.



## No. 76.—O. H. steel bar. Mark, 5.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10". Duplicate of test No. 75, except the shaft was initially heated to about 200° F.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 48,000	0	0	a	Inch. .2001 .2000 .2002	Inch. .1646 .1641 .1642	Inch. .1999 .1999 .1999	Inch. .0353 .0358 .0357	Inch. .0002 .0001 .0003	Bar heated to about 200° F. by means of gas burners. Measurements while hot, for these and subsequent readings.
	0	0	a	.1991	.1609	.1990	.0381	.0001	
			b	.1994	.1618	.1993	.0375	.0001	
			c	.1996	.1623	.1995	.0372	.0001	
1,000	1,000	1,000	a	.2045	.1618	.1991	.0373	.0054	
			b	.2013	.1620	.1991	.0371	.0022	
			c	.1994	.1599	.1968	.0369	.0026	
1,000	1,000	2,000	a	.1894	.1522	.1896	.0374	.0002	
			b	.2018	.1612	.1983	.0371	.0035	
			c	.2079	.1661	.2027	.0366	.0052	
1,000	1,000	3,000	a	.2068	.1888	.2014	.0376	.0054	
			b	.2110	.1819	.2022	.0373	.0018	
			c	.2064	.1662	.2019	.0367	.0045	
28,650	28,650	31,650							
									Bar ruptured.



TEST NO. 83.—*O. H. steel from rod No. 6.*

This and following tests of shafts from rod No. 6 made under the maximum fiber stress of 45,000 pounds per square inch.

The test was begun with the shaft cold; it gradually acquired a higher temperature, and reached about 150° F. at the close of the test.

No. 83.—*O. H. steel bar. Mark, 6.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded. <i>Inch.</i>	Loaded. <i>Inch.</i>	Unloaded. <i>Inch.</i>			
<i>Pounds.</i> 45,000	0	0	<i>a</i>	.1990 .1994 .1991	.1658 .1661 .1657	.1990 .1992 .1988	.0332 .0331 .0331	0. .0002 .0003	
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.2004 .1994 .1997	.1653 .1653 .1656	.1985 .1982 .1986	.0332 .0329 .0331	.0019 .0013 .0011	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1975 .2003 .2004	.1639 .1645 .1648	.1973 .1976 .1983	.0334 .0331 .0350	.0002 .0027 .0021	
1,000	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.2017 .1994 .2006	.1641 .1640 .1643	.1976 .1971 .1978	.0335 .0331 .0335	.0041 .0023 .0028	
	2,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.1989 .1986 .2024	.1623 .1623 .1633	.1960 .1958 .1971	.0337 .0335 .0338	.0029 .0028 .0053	
	55,550	60,550							Bar ruptured. Temperature of bar about 150° F. at close of test.

TEST No. 84.—*O. H. steel from rod No. 6.*

The shaft was initially heated by means of a gas burner, which was lighted 1 hour and 25 minutes before the shaft was run.

The temperature of the shaft at the commencement of the test was about 300° F., and had risen to 337° F., when 10,000 rotations were made.

The temperature continued to rise as the test progressed, the gas burner being kept lighted, and reached 385° at 29,900 rotations.

The shaft was then cooled and rested 16 hours without load, after which it was again heated to 356° F., and the test resumed.

At 70,000 rotations the temperature was 410° F.

The shaft ruptured at 87,550 rotations, the temperature then being 432° F.

TEST No. 85.—*O. H. steel from rod No. 6.*

Tested hot.

Gas was lighted 1 hour and 25 minutes before rotations began, the thermometer indicating 344° F. at the commencement of the test.

At 20,000 rotations the temperature had increased to 386° F., which continued to rise, at 40,000 rotations the thermometer indicating 382° F., and at 60,000, 395° F.

Rupture occurred at 61,800 rotations.

TEST No. 86.—*O. H. steel from rod No. 6.*

The shaft was initially heated by means of a gas burner, which was lighted 20 minutes before the test was begun. The thermometer indicated 300° F. at the commencement of the test.

At 15,000 rotations the thermometer indicated 387°, and at 30,000 rotations, 402° F.

The gas was now turned off and the shaft cooled with water, after which the test was resumed with the shaft cold.

It was allowed to increase in temperature, but without external heating, and reached about 150° F. at the end of the test.

## No. 86.—O. H. steel bar. Mark, 6.

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  Inch.	Sets.	Remarks
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 45,000	30,000	30,000	a	Inch. .1895 .2105 .2053	Inch. .1558 .1654 .1589	Inch. .1894 .2016 .2005	Inch. .0336 .0332 .0416	Inch. .0001 .0089 .0048	
	1,000	31,000	a b c	.1982 .2079 .2040	.1599 .1627 .1624	.1943 .1968 .1969	.0344 .0341 .0345	.0039 .0111 .0071	
	1,000	32,000	a b c	.1926 .2043 .2069	.1575 .1608 .1627	.1922 .1953 .1972	.0347 .0345 .0345	.0004 .0080 .0097	
1,000	33,000	33,000	a b c	.1995 .2002 .2077	.1595 .1597 .1625	.1941 .1942 .1970	.0346 .0345 .0345	.0054 .0060 .0107	
	2,000	35,000	a b c	.2048 .1994 .2068	.1606 .1591 .1622	.1953 .1939 .1970	.0347 .0348 .0348	.0095 .0055 .0098	
	23,550	58,550							Bar ruptured. Temperature about 150° F.

TEST NO. 87.—*O. H. steel from rod No. 7.*

This and the following shafts from rod No. 7 were loaded with 45,000 pounds per square inch maximum fiber stress.

It was initially heated by means of a gas burner to 300° F. at the commencement of the test.

After 15,000 rotations the thermometer indicated 412° F., which increased to 468° at 30,000 rotations.

The gas was turned off and the shaft cooled with water.

The test was resumed, allowing the shaft to increase in temperature, but without external heating. It acquired the temperature of about 150° F. at the end of the test.





TEST No. 88.—*O. H. steel from rod No. 7.*

The test began with the shaft initially heated to 410° F.

After 20,000 rotations the thermometer indicated 425° F.

Then followed an interval of rest, without load, of 15 hours.

The shaft was again heated by a gas burner, and the test resumed.

After 40,000 total number of rotations the thermometer indicated 406° F., which temperature was increased to 412° and 416° at 60,000 and 80,000 rotations respectively.

At the time of rupture the temperature was 410° F.

Rupture occurred at 95,400 rotations.

TEST No. 89.—*O. H. steel from rod No. 7.*

The shaft was initially heated by means of gas burners to the estimated temperature of 700° F. At this temperature the test began.

The shaft made 11,400 rotations when excessive yielding by transverse deflection set in.

There was insufficient power in the belting of the testing apparatus to drive the shaft in its present deflected condition, hence the hot test was discontinued, the shaft cooled with a stream of water, and the test afterward resumed cold.

A few turns of the apparatus were made by hand which straightened the shaft somewhat; it was then run by power, at the usual rate of speed, 400 rotations per minute. Violent wobbling occurred and continued for awhile.

After 20,000 rotations the wobbling still moderately severe, had diminished considerably over the most violent state, and continued to run in about the same manner to the close of the test, the shaft rupturing after 117,900 rotations.

TEST No. 90.—*O. H. steel from rod No. 7.*

Duplicate of test No. 89.

The shaft was heated and made 17,600 rotations at the estimated temperature of 700° F., then cooled with water and run cold for the remainder of the test.

The shaft ruptured at 140,350 rotations.

TEST No. 111.—*O. H. steel shaft from a steel bar marked 15.*

This bar was from a lot of steel used in the second series of temperature tests, and has the following chemical composition:

Elements:	Per cent.
C .....	.72
Mn .....	.76
Si .....	.20
S .....	.056
P .....	.086
Cu .....	.186
Fe by difference .....	97.992

The test was made for the purpose of determining whether the deflection of the shaft sensibly varied on account of difference in speed of rotation, and comparative observations were made under different fiber stresses.

The maximum speed was 2,200 turns per minute.

As described in a previous report (see Report 1888, page 782) the deflections were measured by means of a micrometer mounted on a cross bar below the shaft and very near its middle bearing.

The micrometer made contact with the under side of the shaft, and the smaller of two comparative readings indicated the greater deflection of the shaft.

This shaft was not quite straight at the commencement of the test, causing a slight wobbling motion when rotated, which interfered with accuracy of measurements within narrow limits.

In the tabulated details of the test are columns of figures showing the fiber stress, the total number of rotations made, and the micrometer readings taken at full speed of the shaft, 2,200 rotations per minute, and again when the shaft was slowly turned by hand.

Two other columns which are deduced from the micrometer readings, show the apparent difference in the deflection at these two rates of speed.

It appears from these readings that generally the shaft appeared to deflect more when slowly turned than when at full speed.

It is thought, however, that this effect is due mainly to the fact that the shaft was not quite straight.

Certainly as the fiber stress was increased the differences in deflections decreased, and we are led to conclude that a speed has not yet been reached which causes a sensible change in the deflection of a rotating shaft loaded within the elastic limit of the metal.

*Table showing observations on the total deflection of shaft at different rates of speed.*

Maximum fiber stress per square inch.	Number of rotations.	Micrometer readings.		Greater deflection.	
		Speed 2,200.	Slowly turned.	Speed 2,200.	Slowly turned.
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>
20,000	0	.....	.5816	.....	.....
	1,400	.5810	.5806	.....	.0004
	2,600	.5810	.5818	.0008	.....
	3,700	.5825	.5810	.....	.0015
30,000	3,700	.....	.5206	.....	.....
	5,000	.5215	.5196	.....	.0019
	6,100	.5210	.5190	.....	.0020
	7,560	.5210	.5185	.....	.0025
	11,770	.5200	.5195	.....	.0005
	20,000	.5205	.5207	.0002	.....
	29,900	.5210	.5205	.....	.0005
	40,000	.5210	.5202	.....	.0008
40,000	40,000	.....	.4593	.....	.....
	45,100	.4590	.4584	.....	.0006
	50,200	.4585	.4581	.....	.0004
	55,000	.4590	.4587	.....	.0003
	60,050	.4585	.4584	.....	.0001
50,000	60,050	.....	.3980	.....	.....
	65,650	.3950	.3952	.0002	.....
	70,000	.....	.3960	.....	.....



TEST No. 110.—*O. H. steel shaft from a steel bar marked 21.*

This bar was from a lot of steel used in the second series of temperature tests, and had the following chemical composition :

Elements :	Per cent.
C .....	1.14
Mn .....	.10
Si .....	.15
S .....	Tr.
P .....	.018
Cu .....	0
Fe by difference .....	98.592

Speed of tests, 2,200 rotations per minute.

Tested for the same purpose as No. 111, page 953.

In this test the greater deflections predominated at high speed, in only two instances were the deflections greater when slowly turned, until the fiber stress was increased to 50,000 pounds per square inch, when the deflections were much the greater at slow speed. When slowly turned the shaft was rotated by hand.

The effect of high speed in diminishing the deflection of shafts loaded above their elastic limits has been referred to in previous reports.

Subsequent observations showed the fiber stress, 50,000 pounds per square inch, exceeded the elastic limit of this shaft, thus accounting for the diminished deflections observed under this load when run at high speed.

*Table showing observations on the total deflection of shaft at different rates of speed.*

Maximum fiber stress per square inch.	Number of rotations.	Micrometer readings.		Greater deflection.	
		Speed 2,200.	Slowly turned.	Speed 2,200.	Slowly turned.
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>
0			.7046		
			.7026		
20,000			.5870		
20,000	2,000	.5819	.5835	.0001	
	4,000	.5819	.5826	.0007	
30,000	4,000		.5233		
	4,800	.5210	.5228	.0018	
	6,000	.5218	.5209		.0009
	6,750	.5214	.5214	0.	
40,000	6,750		.4627		
	8,370	.4620	.4622	.0002	
	9,770	.4590	.4631	.0041	
	10,600	.4600	.4615	.0015	
	11,350	.4620	.4621	.0001	
	12,200	.4618	.4611		.0007
50,000	12,200		.4042		
	13,200	.4020	.3990		.0038
	14,100	.3990	.3960		.0030
	14,900	.3960	.3911		.0049
	15,850	.3900	.3832		.0068



TEST No. 41.—*Wrought-iron shaft from rod No. 1.*

The test was begun with the maximum fiber stress, 25,000 pounds per square inch, which was increased by 1,000 pounds per square inch increments, after successive runs of 5,000 turns each.

Slight sets were displayed under the first load, but did not increase rapidly until 29,000 pounds per square inch fiber stress was applied.

The shaft finally ruptured under 47,000 pounds per square inch fiber stress, after having made 111,500 rotations.

No. 41.—*Wrought-iron bar (Burden's). Mark, 1.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress Per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections, Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 25,000	0	0	<i>a</i>	<i>Inch.</i> .2005 .2004 .2006 .2004	<i>Inch.</i> .1817 .1816 .1817	<i>Inch.</i> .2004 .2004 .2001	<i>Inch.</i> .0187 .0188 .0184		
	5,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2005 .2006 .2004	.1820 .1818 .1817	.2004 .2004 .2001	.0184 .0186 .0184	.0001 .0002 .0003	
	0	5,000	<i>a</i> <i>b</i> <i>c</i>	.2007 .2006 .2004	.1813 .1811 .1809	.2005 .2004 .2001	.0192 .0193 .0192	.0002 .0002 .0003	
26,000	5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.2005 .2008 .2005	.1812 .1810 .1808	.2004 .2003 .2001	.0192 .0193 .0193	.0001 .0005 .0004	
	0	10,000	<i>a</i> <i>b</i> <i>c</i>	.2007 .2007 .2004	.1805 .1802 .1801	.2004 .2004 .2000	.0198 .0202 .0199	.0003 .0003 .0004	
	5,000	15,000	<i>a</i> <i>b</i> <i>c</i>	.2009 .2006 .2005	.1804 .1801 .1801	.2004 .2002 .2001	.0200 .0201 .0200	.0005 .0004 .0004	
28,000	0	15,000	<i>a</i> <i>b</i> <i>c</i>	.2008 .2008 .2005	.1795 .1793 .1796	.2003 .2000 .2001	.0208 .0207 .0205	.0003 .0008 .0004	
	5,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.2004 .2009 .2006	.1793 .1792 .1793	.2001 .2000 .2000	.0208 .0208 .0207	.0003 .0009 .0006	
	0	20,000	<i>a</i> <i>b</i> <i>c</i>	.2008 .2009 .2006	.1790 .1786 .1787	.2003 .2000 .2001	.0213 .0214 .0214	.0005 .0009 .0005	

No. 41.—*Wrought-iron bar (Barden's). Mark, 1—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.  30,000	5,000	25,000	<i>a</i>	Inch. .2004 .2012 .2007	Inch. .1739 .1781 .1784	Inch. .2002 .1888 .1999	Inch. .0313 .0307 .0215	Inch. .0002 .0024 .0008	
	0	25,000	<i>a</i> <i>b</i> <i>c</i>	.2009 .2010 .2008	.1780 .1776 .1775	.2002 .1887 .1999	.0222 .0212 .0234	.0007 .0023 .0009	
	5,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.2012 .2003 .2009	.1783 .1770 .1778	.2002 .1993 .1998	.0219 .0223 .0220	.0010 .0010 .0011	
31,000	0	30,000	<i>a</i> <i>b</i> <i>c</i>	.2011 .2011 .2010	.1771 .1762 .1768	.2001 .1993 .1998	.0230 .0231 .0230	.0010 .0018 .0012	
	5,000	35,000	<i>a</i> <i>b</i> <i>c</i>	.2018 .2010 .2011	.1767 .1759 .1764	.1998 .1989 .1995	.0231 .0230 .0231	.0020 .0021 .0016	
	0	35,000	<i>a</i> <i>b</i> <i>c</i>	.2013 .2014 .2013	.1760 .1747 .1755	.1998 .1986 .1995	.0238 .0239 .0240	.0015 .0028 .0018	
32,000	5,000	40,000	<i>a</i> <i>b</i> <i>c</i>	.2005 .2026 .2016	.1749 .1740 .1765	.1990 .1882 .1991	.0241 .0242 .0236	.0015 .0044 .0025	
	0	40,000	<i>a</i> <i>b</i> <i>c</i>	.2017 .2012 .2016	.1749 .1734 .1745	.1994 .1881 .1991	.0245 .0247 .0246	.0023 .0031 .0025	
	5,000	45,000	<i>a</i> <i>b</i> <i>c</i>	.2005 .2002 .2031	.1785 .1720 .1741	.1983 .1968 .1986	.0248 .0248 .0245	.0022 .0034 .0045	
34,000	0	45,000	<i>a</i> <i>b</i> <i>c</i>	.2024 .2020 .2023	.1736 .1717 .1733	.1988 .1972 .1985	.0252 .0255 .0253	.0036 .0048 .0038	



35,000	5,000	50,000	a b c	.1990 .2032 .2028	.1715 .1713 .1722	.1971 .1969 .1977	.0256 .0256 .0255	.0019 .0083 .0051
	0	50,000	a b c	.2028 .2032 .2031	.1715 .1700 .1715	.1979 .1964 .1978	.0284 .0264 .0263	.0049 .0068 .0053
	5,000	55,000	a b c	.1998 .2064 .2080	.1699 .1696 .1705	.1963 .1962 .1967	.0264 .0266 .0262	.0035 .0102 .0113
36,000	0	55,000	a b c	.2039 .2025 .2009	.1738 .1714 .1703	.2001 .1981 .1971	.0263 .0267 .0268	.0038 .0044 .0088
	5,000	60,000	a b c	.2039 .1988 .2065	.1685 .1658 .1693	.1958 .1934 .1964	.0273 .0276 .0271	.0081 .0054 .0101
37,600	0	60,000	a b c	.2049 .2031 .2039	.1701 .1673 .1668	.1976 .1950 .1965	.0275 .0277 .0277	.0073 .0081 .0074
	5,000	65,000	a b c	.2077 .1995 .2056	.1670 .1643 .1670	.1958 .1931 .1955	.0288 .0288 .0285	.0119 .0064 .0101
38,000	0	65,000	a b c	.2060 .2040 .2054	.1666 .1641 .1660	.1959 .1936 .1954	.0293 .0295 .0294	.0101 .0104 .0100
	5,000	70,000	a b c	.1987 .2107 .2044	.1640 .1658 .1650	.1934 .1954 .1944	.0294 .0295 .0294	.0053 .0153 .0100
39,000	0	70,000	a b c	.2053 .2058 .2060	.1653 .1644 .1642	.1954 .1948 .1943	.0301 .0304 .0301	.0099 .0110 .0107
	5,000	75,000	a b c	.1986 .2126 .2020	.1643 .1679 .1630	.1940 .1976 .1931	.0297 .0297 .0301	.0046 .0150 .0089
40,000	0	75,000	a b c	.2045 .2078 .2036	.1650 .1655 .1624	.1956 .1964 .1934	.0306 .0309 .0310	.0089 .0114 .0102
	5,000	80,000	a b c	.2159 .2006 .1999	.1718 .1638 .1615	.2020 .1944 .1923	.0302 .0306 .0308	.0139 .0062 .0076

No. 41.—Wrought-iron bar (*Burden's*). *Mark, 1—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections: <i>Inch.</i>	Sets.	Remarks.	
	Successive.	Total.	On line.	Unloaded.		Loaded.				Unloaded.
				<i>Inch.</i>	<i>Inch.</i>					
<i>Pounds.</i> 41,000	0	80,000	<i>a</i>		.2098 .2044 .2012	.1878 .1618 .1603	.1994 .1938 .1921	.0316 .0320 .0318	<i>Inch.</i> .0104 .0106 .0091	
	5,000	85,000	<i>a</i> <i>b</i> <i>c</i>		.2159 .2089 .2023	.1654 .1628 .1578	.1968 .1945 .1898	.0314 .0317 .0320	.0191 .0144 .0125	
	0	85,000	<i>a</i> <i>b</i> <i>c</i>		.2091 .2084 .2042	.1621 .1602 .1567	.1950 .1932 .1898	.0329 .0330 .0331	.0141 .0152 .0144	
42,000	5,000	90,000	<i>a</i> <i>b</i> <i>c</i>		.2176 .1881 .2055	.1752 .1517 .1652	.2068 .1838 .1872	.0316 .0321 .0320	.0108 .0043 .0083	
	0	90,000	<i>a</i> <i>b</i> <i>c</i>		.2139 .1949 .2050	.1713 .1527 .1629	.2041 .1859 .1860	.0328 .0332 .0331	.0098 .0090 .0090	
	5,000	95,000	<i>a</i> <i>b</i> <i>c</i>		.2040 .2201 .1852	.1681 .1764 .1493	.1984 .2086 .1822	.0323 .0322 .0329	.0056 .0115 .0060	
44,000	0	95,000	<i>a</i> <i>b</i> <i>c</i>		.2058 .2154 .1908	.1680 .1725 .1494	.1996 .2063 .1833	.0336 .0338 .0339	.0062 .0091 .0075	
	5,000	100,000	<i>a</i> <i>b</i> <i>c</i>		.2230 .1838 .2027	.1809 .1474 .1631	.2138 .1809 .1963	.0329 .0335 .0332	.0092 .0029 .0064	
	0	100,000	<i>a</i> <i>b</i> <i>c</i>		.2189 .1902 .2019	.1771 .1491 .1613	.2113 .1835 .1956	.0342 .0344 .0343	.0076 .0067 .0063	
45,000	5,000	105,000	<i>a</i> <i>b</i> <i>c</i>		.1854 .2277 .1959	.1510 .1824 .1576	.1847 .2162 .1918	.0337 .0338 .0342	.0007 .0115 .0041	

[illegible]

TEST No. 42.—*Wrought-iron shaft from rod No. 1.*

The test was made with the fiber stress 40,000 pounds per square inch.

After completing 30,000 rotations a fine crack was discovered near the middle bearing.

The shaft was now removed from the machine and rested without load a period of 65 days, after which the test was resumed with the same load as before.

The effect of the interval of rest was shown by the smaller sets observed afterward, but this was only a temporary effect, for after 1,000 more rotations the sets were increased again.

No. 42.—*Wrought-iron bar (Burden's). Mark, 1.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Loaded.		Unloaded.				
				<i>Inch.</i>	<i>Inch.</i>					
<i>Pounds.</i> 40,000	0	0	<i>a</i> <i>b</i> <i>c</i>	.1999 .2004 .2003	.1693 .1698 .1693	.1995 .1998 .1994	.0302 .0300 .0301	.0004 .0006 .0009		
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.2130 .1985 .2129	.1565 .1560 .1602	.1880 .1873 .1914	.0315 .0313 .0312	.0250 .0112 .0215		
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1858 .2203 .2097	.1501 .1633 .1598	.1813 .1938 .1911	.0312 .0305 .0313	.0045 .0265 .0186		
	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1859 .2195 .2118	.1480 .1598 .1584	.1799 .1910 .1900	.0319 .0312 .0316	.0060 .0285 .0218		
	1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.2063 .1941 .2181	.1557 .1517 .1620	.1873 .1834 .1930	.0316 .0317 .0310	.0190 .0107 .0251		
	1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2190 .2123 .2069	.1566 .1590 .1564	.1889 .1906 .1881	.0323 .0316 .0317	.0301 .0217 .0183		
	5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.2166 .2079 .1935	.1719 .1690 .1553	.2020 .1996 .1861	.0301 .0306 .0308	.0146 .0083 .0074		
	10,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.1848 .2135 .2044	.1542 .1763 .1695	.1846 .2063 .2000	.0304 .0300 .0305	.0002 .0072 .0044		
	10,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.1861 .2153 .2022	.1553 .1773 .1673	.1858 .2073 .1982	.0305 .0300 .0309	.0003 .0080 .0040		
Crack discovered; bar removed from machine before complete rupture; tested 65 days.										

Crack discovered; bar removed from machine before complete rupture; rested 65 days.

No. 42.—Wrought-iron bar (*Burden's*). *Mark, 1*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	30,000	<i>a</i> <i>b</i> <i>c</i>	<i>Inch.</i> .1924 .2102 .1997	<i>Inch.</i> .1612 .1791 .1680	<i>Inch.</i> .1912 .2089 .1984	<i>Inch.</i> .0300 .0298 .0304	<i>Inch.</i> .0015 .0013 .0013	
	1,000	31,000	<i>a</i> <i>b</i> <i>c</i>	.1925 .2091 .2030	.1601 .1702 .1660	.1911 .2011 .1970	.0310 .0309 .0310	.0014 .0080 .0060	
	1,000	32,000	<i>a</i> <i>b</i> <i>c</i>	.2044 .2039 .2032	.1626 .1687 .1632	.1940 .1992 .1965	.0314 .0305 .0313	.0104 .0047 .0067	
	1,000	33,000	<i>a</i> <i>b</i> <i>c</i>	.1983 .2083 .2034	.1611 .1684 .1632	.1928 .1969 .1958	.0317 .0305 .0316	.0055 .0094 .0076	
	8,050	41,050							Bar ruptured.

TEST No. 43.— *Wrought-iron shaft from rod No. 1.*

The shaft was tested under the maximum fiber stress, 40,000 pounds per square inch.

At intervals of 10,000 rotations the shaft was removed from the testing machine and annealed at 323° to 325° F.

After each annealing there was a temporary reduction in the magnitude of the sets.

The shaft finally ruptured at 86,200 rotations.

No. 43.—*Wrought-iron bar (Burden's). Mark, 1.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.		Loaded.			
				Inch.		Inch.			
40,000	0	0	a	.1980	.1887	.1986	.0299	Inch. .0004	
			b	.1906	.1693	.1991	.0288	.0005	
			c	.1994	.1602	.1989	.0297	.0005	
	1,000	1,000	a	.2109	.1597	.1905	.0308	.0204	
			b	.1998	.1568	.1982	.0314	.0116	
			c	.2088	.1616	.1924	.0308	.0164	
	1,000	2,000	a	.2137	.1573	.1884	.0311	.0253	
			b	.2106	.1588	.1899	.0311	.0207	
			c	.2065	.1584	.1895	.0311	.0170	
	1,000	3,000	a	.2026	.1552	.1865	.0313	.0161	
			b	.2153	.1600	.1910	.0310	.0243	
			c	.2056	.1578	.1889	.0311	.0167	
40,000	1,000	4,000	a	.2025	.1570	.1882	.0312	.0143	
			b	.2152	.1611	.1919	.0308	.0233	
			c	.2038	.1573	.1883	.0310	.0155	
	1,000	5,000	a	.1844	.1503	.1815	.0312	.0029	
			b	.2156	.1601	.1908	.0307	.0248	
			c	.2102	.1612	.1917	.0305	.0185	
	5,000	10,000	a	.2187	.1789	.2037	.0298	.0120	
			b	.1971	.1625	.1980	.0305	.0041	
			c	.1975	.1618	.1921	.0303	.0054	
	0	10,000	a	.2018	.1722	.2015	.0293	.0003	
			b	.1987	.1685	.1983	.0298	.0004	
			c	.1975	.1677	.1973	.0296	.0002	
40,000	1,000	11,000	a	.2037	.1703	.2006	.0303	.0031	
			b	.1996	.1665	.1966	.0301	.0030	
			c	.1985	.1664	.1962	.0298	.0023	

Bar straightened and then annealed at temperature of 423° F.; first annealing.



Bar straightened and then annealed at temperature of 425° F.; second annealing.

Bar annealed at temperature of 425° F.; third annealing.

1,000	12,000	a	.1691	.1905	.0304	.0020
		b	.1650	.1934	.0204	.0030
		c	.1658	.1959	.0301	.0040
1,600	13,000	a	.1676	.1975	.0302	.0008
		b	.1646	.1962	.0306	.0070
		c	.1651	.1952	.0301	.0047
1,000	14,000	a	.1667	.1974	.0307	.0014
		b	.1643	.1950	.0307	.0081
		c	.1644	.1948	.0304	.0056
1,000	15,000	a	.1665	.1974	.0309	.0064
		b	.1623	.1933	.0310	.0049
		c	.1642	.1947	.0305	.0075
5,000	20,000	a	.1618	.1934	.0316	.0098
		b	.1619	.1934	.0315	.0135
		c	.1610	.1924	.0314	.0100
40,000	20,000	a	.1700	.1908	.0298	.0002
		b	.1691	.1909	.0298	.0002
		c	.1692	.1906	.0298	.0003
1,000	21,000	a	.1687	.1909	.0302	.0034
		b	.1672	.1974	.0302	.0025
		c	.1674	.1973	.0299	.0024
1,000	22,000	a	.1674	.1979	.0305	.0048
		b	.1660	.1965	.0305	.0050
		c	.1661	.1964	.0303	.0037
1,000	23,000	a	.1655	.1961	.0306	.0009
		b	.1650	.1957	.0307	.0075
		c	.1655	.1959	.0304	.0052
1,000	24,000	a	.1643	.1952	.0309	.0008
		b	.1645	.1953	.0308	.0085
		c	.1647	.1954	.0307	.0065
1,000	25,000	a	.1640	.1951	.0311	.0026
		b	.1639	.1949	.0310	.0098
		c	.1640	.1947	.0307	.0070
5,000	30,000	a	.1632	.1948	.0316	.0134
		b	.1698	.1913	.0315	.0070
		c	.1620	.1932	.0312	.0114
0	30,000	a	.1698	.1906	.0298	.0001
		b	.1695	.1991	.0296	.0004
		c	.1689	.1987	.0298	.0003

40,000

No. 43.—Wrought-iron bar (*Burden's*). *Mark, 1*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
			<i>Inch.</i> .2008 .2011 .1999	<i>Inch.</i> .1877 .1677 .1676	<i>Inch.</i> .1980 .1972 .1976	<i>Inch.</i> .0303 .0339 .0300			
<i>Pounds.</i> 40,000	1,000	31,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0328 .0339 .0300		Bar annealed at temperature of 425° F.; fourth annealing.
	2,000	33,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0308 .0310 .0304		
	1,000	34,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0309 .0310 .0306		
1,000	35,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0300 .0313 .0307			
5,000	40,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0315 .0317 .0315			
0	40,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0309 .0309 .0309			
1,000	41,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0305 .0305 .0304			
1,000	42,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0306 .0308 .0305			
1,000	43,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .0309 .0312 .0306			
1,000	44,000	<i>a</i> <i>b</i> <i>c</i>				<i>Inch.</i> .1911 .1912 .1910			

40,000	1,000	45,000	a	.1969	.1680	.1941	.0311	.0028
			b	.1989	.1615	.1928	.0313	.0051
			c	.2047	.1688	.1945	.0307	.0102
	5,000	50,000	a	.1939	.1602	.1918	.0316	.0021
			b	.1987	.1598	.1912	.0316	.0075
			c	.2074	.1628	.1938	.0310	.0136
	0	50,000	a	.1995	.1694	.1993	.0299	.0002
			b	.1994	.1680	.1987	.0298	.0007
			c	.1995	.1694	.1992	.0298	.0003
	1,000	51,000	a	.2025	.1662	.1968	.0306	.0057
40,000	1,000	52,000	a	.2023	.1653	.1960	.0307	.0063
			b	.2011	.1663	.1966	.0303	.0045
	1,000	52,000	a	.1958	.1639	.1949	.0310	.0009
			b	.1994	.1620	.1940	.0311	.0054
			c	.2039	.1649	.1956	.0307	.0083
	1,000	53,000	a	.1965	.1635	.1945	.0310	.0020
			b	.2049	.1634	.1945	.0311	.0104
			c	.2022	.1643	.1950	.0307	.0072
	1,000	54,000	a	.2015	.1636	.1948	.0312	.0067
			b	.1989	.1615	.1930	.0315	.0050
40,000	1,000	55,000	a	.2045	.1643	.1950	.0307	.0095
			b	.2063	.1642	.1954	.0312	.0109
			c	.1997	.1633	.1935	.0312	.0062
	5,000	60,000	a	.2034	.1637	.1946	.0309	.0086
			b	.1989	.1613	.1929	.0310	.0060
			c	.2078	.1623	.1937	.0314	.0141
	0	60,000	a	.2029	.1616	.1928	.0312	.0101
			b	.2001	.1700	.1989	.0299	.0002
			c	.1993	.1690	.1989	.0299	.0004
	1,000	61,000	a	.1990	.1688	.1987	.0299	.0003
40,000	1,000	62,000	a	.2010	.1668	.1974	.0306	.0036
			b	.2021	.1659	.1965	.0306	.0056
			c	.2003	.1665	.1968	.0303	.0035
	1,000	62,000	a	.1990	.1649	.1960	.0311	.0030
			b	.1985	.1636	.1947	.0311	.0048
			c	.2028	.1651	.1958	.0307	.0070
	1,000	63,000	a	.2039	.1644	.1956	.0312	.0083
			b	.1995	.1623	.1938	.0313	.0059
			c	.2033	.1640	.1943	.0309	.0084

Bar annealed at temperature of 425° F.; fifth annealing.

Bar annealed at temperature of 425° F.; sixth annealing.

No. 43.—Wrought-iron bar (*Burden's*). *Mark*, 1—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets. <i>Inch.</i>	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
40,000	1,000	64,000	<i>a</i>	<i>Inch.</i> .2019	<i>Inch.</i> .1824	<i>Inch.</i> .1930	.0315	.0080	Bar annealed at temperature of 425° F.; seventh annealing.
			<i>b</i>	.2060	.1823	.1938	.0315	.0122	
			<i>c</i>	.2026	.1826	.1935	.0309	.0091	
	1,000	65,000	<i>a</i>	.1922	.1595	.1912	.0317	.0010	
			<i>b</i>	.2044	.1613	.1829	.0316	.0115	
			<i>c</i>	.2051	.1628	.1939	.0311	.0112	
	5,000	70,000	<i>a</i>	.1971	.1804	.1922	.0318	.0049	
			<i>b</i>	.2083	.1616	.1934	.0318	.0149	
			<i>c</i>	.2037	.1615	.1928	.0313	.0109	
	0	70,000	<i>a</i>	.1999	.1696	.1998	.0302	.0001	
			<i>b</i>	.1991	.1685	.1986	.0301	.0005	
			<i>c</i>	.1992	.1688	.1988	.0300	.0004	
40,000	1,000	71,000	<i>a</i>	.2035	.1657	.1968	.0311	.0067	
			<i>b</i>	.1994	.1640	.1951	.0311	.0043	
			<i>c</i>	.2018	.1653	.1960	.0307	.0058	
	1,000	72,000	<i>a</i>	.1944	.1616	.1933	.0317	.0011	
			<i>b</i>	.2050	.1628	.1942	.0314	.0108	
			<i>c</i>	.2033	.1636	.1948	.0312	.0085	
	1,000	73,000	<i>a</i>	.1928	.1601	.1916	.0315	.0010	
			<i>b</i>	.2044	.1619	.1934	.0315	.0110	
			<i>c</i>	.2045	.1630	.1942	.0312	.0103	
	1,000	74,000	<i>a</i>	.2040	.1621	.1937	.0316	.0103	
			<i>b</i>	.2065	.1621	.1936	.0315	.0129	
			<i>c</i>	.2025	.1619	.1931	.0312	.0094	
40,000	1,000	75,000	<i>a</i>	.2072	.1624	.1943	.0319	.0129	
			<i>b</i>	.1998	.1608	.1924	.0316	.0074	
			<i>c</i>	.2040	.1620	.1932	.0312	.0108	
	5,000	80,000	<i>a</i>	.2064	.1589	.1966	.0377	.0098	
			<i>b</i>	.2080	.1611	.1933	.0322	.0157	
			<i>c</i>	.2033	.1592	.1962	.0270	.0071	

Bar annealed at temperature of 425° F.; eighth annealing.

40,000	0	80,000	a b c	.1988 .1986 .2001	.1880 .1884 .1888	.1985 .1989 .1992	.0305 .0305 .0304	.0003 .0007 .0009
	1,000	81,000	a b c	.2025 .2047 .2022	.1825 .1840 .1834	.1945 .1955 .1949	.0320 .0315 .0315	.0080 .0092 .0073
	1,000	82,000	a b c	.1918 .2041 .2052	.1584 .1619 .1618	.1909 .1936 .1039	.0325 .0317 .0321	.0009 .0105 .0113
	1,000	83,000	a b c	.1959 .2000 .2067	.1886 .1801 .1805	.1916 .1924 .1929	.0330 .0323 .0324	.0043 .0076 .0138
	1,000	84,000	a b c	.2049 .2098 .2086	.1568 .1814 .1580	.1905 .1940 .1910	.0337 .0326 .0330	.0144 .0158 .0126
	1,000	85,000	a b c	.2114 .2059 .2046	.1559 .1604 .1558	.1905 .1936 .1895	.0346 .0332 .0337	.0209 .0123 .0151
	1,200	86,200						Bar ruptured.

**TEST No. 44.—***Wrought-iron shaft from rod No. 1.*

The conditions of this test were similar to the preceding, excepting the interval between annealings was increased to 20,000 rotations.

Rupture occurred at 110,000 rotations.

No. 44.—Wrought-iron bar (*Burden's*). *Mark 1.*

This bar was crooked. Straightened cold before testing.  
 Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Deflections.  Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.		Loaded. *	Unloaded.			
				Inch.						
Pounds. 40,000	0	0	a	.1999	.1663	.1959	.0296	Inch. .0040 .0067 .0051		
			b	.2013	.1651	.1946	.0295			
			c	.2058	.1707	.2007	.0300			
	1,000	1,000	a	.2020	.1662	.1967	.0305	.0053		
			b	.2036	.1643	.1953	.0305			
			c	.2038	.1659	.1965	.0306			
	2,000	3,000	a	.1976	.1644	.1950	.0306	.0026		
			b	.1976	.1632	.1937	.0305			
			c	.2074	.1661	.1968	.0307			
	1,000	4,000	a	.1956	.1633	.1940	.0307	.0016		
			b	.2052	.1645	.1951	.0306			
			c	.2051	.1658	.1965	.0307			
	1,000	5,000	a	.2061	.1663	.1969	.0306	.0022		
			b	.2025	.1645	.1953	.0307			
			c	.2035	.1655	.1962	.0307			
	5,000	10,000	a	.2061	.1665	.1972	.0307	.0089		
			b	.1976	.1635	.1942	.0307			
			c	.2048	.1664	.1971	.0307			
	10,000	20,000	a	.1973	.1653	.1959	.0306	.0014		
			b	.1950	.1621	.1928	.0307			
			c	.2085	.1680	.1987	.0307			
	0	20,000	a	.2009	.1708	.2008	.0300	.0001		
			b	.1983	.1681	.1931	.0300			
			c	.2009	.1708	.2007	.0299			
1,000	21,000	a	.2000	.1698	.1999	.0301	.0001			
		b	.1981	.1674	.1974	.0300				
		c	.2018	.1697	.1998	.0301				

Bar straightened and annealed at temperature of 4150 F.; first annealing.

Bar straightened and annealed at temperature of 415° F.; first annealing.

No. 44.—Wrought-iron bar (*Burden's*). *Mark 1*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	1,000	22,000	<i>a</i>	<i>Inch.</i> .2004 .1995 .2018	<i>Inch.</i> .1694 .1672 .1690	<i>Inch.</i> .1997 .1973 .1993	<i>Inch.</i> .0303 .0301 .0303	<i>Inch.</i> .0007 .0022 .0025	Bar straightened and annealed at temperature of 415° F.; second annealing.
	1,000	23,000	<i>a</i> <i>b</i> <i>c</i>	.2010 .1998 .2019	.1690 .1677 .1684	.1993 .1970 .1988	.0303 .0303 .0304	.0017 .0028 .0031	
	1,000	24,000	<i>a</i> <i>b</i> <i>c</i>	.2033 .1991 .2023	.1691 .1665 .1679	.1993 .1967 .1985	.0302 .0302 .0306	.0040 .0024 .0038	
	1,000	25,000	<i>a</i> <i>b</i> <i>c</i>	.2036 .1988 .2024	.1688 .1668 .1676	.1991 .1965 .1983	.0303 .0302 .0307	.0045 .0023 .0041	
	5,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.1989 .2023 .2030	.1664 .1653 .1664	.1970 .1959 .1971	.0306 .0306 .0307	.0019 .0064 .0059	
	10,000	40,000	<i>a</i> <i>b</i> <i>c</i>	.1976 .1972 .2004	.1645 .1628 .1660	.1951 .1936 .1969	.0306 .0308 .0309	.0025 .0036 .0095	
	0	40,000	<i>a</i> <i>b</i> <i>c</i>	.2012 .1979 .2009	.1709 .1678 .1705	.2011 .1977 .2006	.0302 .0299 .0301	.0001 .0002 .0003	
	1,000	41,000	<i>a</i> <i>b</i> <i>c</i>	.2014 .1978 .2027	.1691 .1663 .1686	.1994 .1966 .1991	.0303 .0303 .0305	.0020 .0012 .0036	
	1,000	42,000	<i>a</i> <i>b</i> <i>c</i>	.2011 .1979 .2046	.1680 .1659 .1681	.1984 .1960 .1985	.0304 .0301 .0304	.0027 .0019 .0061	
	1,000	43,000	<i>a</i> <i>b</i> <i>c</i>	.2013 .1978 .2039	.1674 .1652 .1672	.1979 .1956 .1979	.0295 .0304 .0307	.0034 .0022 .0060	





No. 44.—*Wrought-iron bar (Burden's). Mark, 1—Continued.*

Maximum fiber stress per square Inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	• 1,000	81,000	a b c	Inch. .2013 .2018 .2026	Inch. .1874 .1882 .1888	Inch. .1981 .1987 .1977	Inch. .0307 .0305 .0309	Inch. .0302 .0301 .0349	Bar annealed at temperature of 425° F.; fifth annealing.
	1,000	82,000	a b c	.1988 .1990 .2048	.1856 .1647 .1664	.1964 .1971	.0308 .0306 .0307	.0004 .0037 .0077	
	1,000	83,000	a b c	.2034 .2034 .2033	.1662 .1649 .1654	.1970 .1956 .1966	.0308 .0307 .0312	.0064 .0078 .0067	
	1,000	84,000	a b c	.2042 .2034 .2035	.1657 .1646 .1651	.1968 .1854 .1964	.0309 .0308 .0313	.0076 .0080 .0071	
	1,000	85,000	a b c	.1991 .2041 .2033	.1649 .1647 .1647	.1960 .1955 .1980	.0311 .0308 .0313	.0031 .0086 .0073	
	5,000	90,000	a b c	.2011 .2049 .2037	.1640 .1647 .1641	.1955 .1954 .1956	.0315 .0307 .0315	.0056 .0095 .0081	
	10,000	100,000	a b c	.2060 .1875 .2060	.1645 .1611 .1636	.1982 .1924 .1954	.0317 .0313 .0318	.0098 .0051 .0106	
	0	100,000	a b c	.2068 .1988 .2012	.1699 .1684 .1698	.2008 .1985 .2006	.0307 .0301 .0308	.0002 .0003 .0006	
	1,000	101,000	a b c	.2048 .1994 .2028	.1677 .1656 .1658	.1988 .1962 .1974	.0311 .0306 .0316	.0060 .0032 .0054	
	1,000	102,000	a b c	.2060 .2012 .2030	.1666 .1647 .1645	.1981 .1956 .1962	.0315 .0309 .0317	.0079 .0056 .0068	

1, 000	103, 000	a b c	.2004 .1976 .2059	.1651 .1629 .1640	.1964 .1899 .1959	.0313 .0310 .0319	.0040 .0037 .0100
1, 000	104, 000	a b c	.2060 .1985 .2041	.1657 .1653 .1630	.1973 .1943 .1953	.0316 .0310 .0323	.0087 .0042 .0088
1, 000	105, 000	a b c	.2078 .2002 .2085	.1658 .1634 .1619	.1975 .1945 .1945	.0317 .0311 .0326	.0103 .0057 .0090
5, 000	110, 000						

Bar ruptured.

No. 45.—*Wrought-iron bar (Burden's). Mark, 2.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Set. Inch.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	<i>a</i>	Inch. .1990	Inch. .1688	Inch. .1987	.0301	.0003	
			<i>b</i>	.2000	.1697	.1995	.0298	.0005	
			<i>c</i>	.1983	.1668	.1988	.0300	.0005	
	1,000	1,000	<i>a</i>	.2089	.1570	.1886	.0316	.0203	
			<i>b</i>	.2100	.1629	.1938	.0309	.0062	
			<i>c</i>	.2041	.1578	.1891	.0313	.0050	
	1,000	2,000	<i>a</i>	.1818	.1478	.1798	.0320	.0020	
			<i>b</i>	.2088	.1594	.1903	.0309	.0185	
			<i>c</i>	.2133	.1587	.1900	.0313	.0233	
	1,000	3,000	<i>a</i>	.2104	.1652	.1876	.0324	.0228	
			<i>b</i>	.1972	.1567	.1880	.0313	.0092	
			<i>c</i>	.2123	.1879	.1894	.0315	.0229	
	1,000	4,000	<i>a</i>	.2109	.1555	.1832	.0327	.0227	
			<i>b</i>	.1981	.1566	.1870	.0314	.0091	
			<i>c</i>	.2129	.1595	.1906	.0311	.0223	
	1,000	5,000	<i>a</i>	.1829	.1430	.1800	.0320	.0029	
			<i>b</i>	.2156	.1607	.1919	.0312	.0239	
			<i>c</i>	.2108	.1585	.1900	.0315	.0208	
	5,000	10,000	<i>a</i>	.2144	.1700	.2008	.0308	.0136	
			<i>b</i>	.1904	.1553	.1860	.0307	.0044	
			<i>c</i>	.2057	.1652	.1954	.0302	.0103	
	10,000	20,000	<i>a</i>	.1862	.1452	.1856	.0304	.0006	
			<i>b</i>	.2162	.1756	.2054	.0298	.0108	
			<i>c</i>	.2006	.1641	.1945	.0304	.0061	
	10,000	30,000	<i>a</i>	.1812	.1507	.1811	.0304	.0001	
			<i>b</i>	.2085	.1709	.2010	.0301	.0075	
			<i>c</i>	.2087	.1710	.2012	.0302	.0035	

10,000	40,000	a	.2117	.1861	.1973	.0312	.0144
		b	.2086	.1708	.2012	.0304	.0074
		c	.1938	.1559	.1866	.0310	.0072
10,000	50,000	a	.1888	.1558	.1868	.0310	.0020
		b	.2173	.1732	.2040	.0308	.0133
		c	.1985	.1610	.1924	.0314	.0061
3,950	53,950						

No. 46.—*Wrought-iron bar (Burden's). Mark, 2.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Deflections.  <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.						
				Unloaded.	Loaded.	Unloaded.	Loaded.			
<i>Pounds.</i> 40,000	0	0	<i>a</i>	<i>Inch.</i> .2003 .2003 .2004	<i>Inch.</i> .1699 .1702 .1698	<i>Inch.</i> .1699 .2000 .1998	<i>Inch.</i> .0300 .0298 .0300	<i>Inch.</i> .0004 .0003 .0006		
	1,000	1,000	<i>a</i> <i>b</i> <i>a</i>	.1950 .2131 .2085	.1569 .1630 .1567	.1881 .1936 .1886	.0312 .0306 .0319	.0069 .0195 .0199		
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1862 .2163 .2130	.1508 .1613 .1571	.1821 .1920 .1869	.0313 .0317 .0318	.0041 .0243 .0241		
1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1816 .2065 .2170	.1489 .1568 .1566	.1804 .1897 .1901	.0315 .0309 .0315	.0012 .0188 .0269			
1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.1995 .1912 .2211	.1552 .1515 .1602	.1866 .1828 .1917	.0314 .0313 .0315	.0129 .0084 .0294			
1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2162 .2078 .2045	.1654 .1621 .1543	.1959 .1931 .1861	.0305 .0310 .0318	.0223 .0147 .0184			
5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.1884 .2188 .2043	.1559 .1723 .1613	.1863 .2023 .1926	.0304 .0300 .0313	.0021 .0165 .0117			
10,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.2141 .1862 .2064	.1762 .1539 .1678	.2065 .1843 .1981	.0303 .0304 .0303	.0076 .0019 .0083			
10,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.1963 .2183 .1947	.1634 .1792 .1571	.1935 .2092 .1883	.0303 .0304 .0303	.0028 .0091 .0064			

	10,000	40,000	a	.2112 .2109 .1914	.1725 .1733 .1528	.2025 .2035 .1840	.0300 .0302 .0312	.0087 .0074 .0074	Bar ruptured.
	6,800	46,800	b c						

TEST No. 47.—*Wrought-iron shaft from rod No. 2.*

At intervals of 10,000 rotations the shaft was annealed at 425° F. with the same effects upon the sets as heretofore mentioned.

After completing 70,000 rotations the shaft rested without load a period of 44 days.

This prolonged rest appeared to have some influence upon the sets similar to annealing, but in a less marked manner.

At the time of the seventh annealing the bar was placed in a tank containing pine shavings to cool slowly.

The shavings, which had been heated by a gas burner under the tank, ignited, and may have temporarily raised the temperature of the shaft.



No. 47.—*Wrought-iron bar (Burden's). Mark, 2.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 40,000	0	0	a	Inch. .1994 .1997 .2002	Inch. .1691 .1693 .1697	Inch. .1990 .1993 .1996	Inch. .0299 .0300 .0299	Inch. .0004 .0004 .0006	
	10,000	10,000	a b c	.2055 .2150 .2080	.1578 .1652 .1577	.1893 .1960 .1893	.0315 .0308 .0316	.0162 .0190 .0137	
	0	10,000	a b c	.2020 .1999 .1997	.1698 .1696 .1694	.1998 .1996 .1994	.0300 .0300 .0300	.0022 .0003 .0003	Bar annealed at temperature of 425° F.; first annealing.
40,000	10,000	20,000	a b c	.2091 .1970 .2076	.1626 .1585 .1643	.1939 .1899 .1951	.0313 .0314 .0308	.0152 .0071 .0125	
	0	20,000	a b c	.2006 .1994 .1998	.1703 .1690 .1695	.2003 .1980 .1994	.0300 .0300 .0299	.0003 .0004 .0004	Bar annealed at temperature of 425° F.; second annealing.
	10,000	30,000	a b c	.1869 .2065 .2096	.1546 .1615 .1652	.1860 .1929 .1960	.0314 .0314 .0308	.0009 .0136 .0136	
40,000	0	30,000	a b c	.1999 .2003 .1997	.1690 .1694 .1691	.1994 .1907 .1993	.0304 .0303 .0302	.0005 .0006 .0004	Bar annealed at temperature of 425° F.; third annealing.
	10,000	40,000	a b c	.2010 .1971 .2108	.1589 .1579 .1638	.1905 .1896 .1982	.0316 .0317 .0314	.0105 .0075 .0156	Suddenly quenched after each annealing up to this time; here- after slowly cooled. Bar annealed at temperature of 425° F.; fourth annealing.

No. 47.—Wrought-iron bar (*Burden's*). *Mark, 2—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Setts.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.		
Pounds. 40,000	0	40,000	<i>a</i>	Inch. .1976 .2027 .1990	Inch. .1676 .1717 .1686	Inch. .1976 .2019 .1986	Inch. 0. .0008 .0004	Bar annealed at temperature of 425° F.; fifth annealing.
	10,000	50,000	<i>a</i>	.2019 .2113 .2031	.1594 .1642 .1605	.1911 .1954 .1921	.0108 .0119 .0110	
	0	50,000	<i>a</i>	.1989 .2000 .2008	.1680 .1691 .1689	.1984 .1994 .2002	.0005 .0006 .0006	
40,000	10,000	60,000	<i>a</i>	.2064 .2104 .2040	.1590 .1638 .1605	.1909 .1952 .1921	.0155 .0152 .0119	
	0	60,000	<i>a</i>	.1988 .2008 .2003	.1684 .1704 .1698	.1982 .2001 .1997	.0006 .0007 .0006	
	10,000	70,000	<i>a</i>	.1852 .2092 .2089	.1533 .1624 .1623	.1850 .1929 .1941	.0002 .0153 .0148	
40,000	0	70,000	<i>a</i>	.2006 .2022 .2008	.1667 .1688 .1684	.1970 .1991 .1986	.0036 .0031 .0022	
	1,000	71,000	<i>a</i>	.1884 .2069 .2084	.1548 .1617 .1626	.1869 .1934 .1940	.0015 .0135 .0144	
	1,000	72,000	<i>a</i>	.1892 .2100 .2077	.1546 .1621 .1622	.1870 .1939 .1936	.0022 .0161 .0141	
40,000	1,000	73,000	<i>a</i>	.1998 .1988 .2106	.1572 .1586 .1615	.1893 .1946 .1936	.0005 .0082 .0170	

Heated to 425° in oil, and temperature maintained 1 hour, then put in hot shavings, which ignited, and temperature may have increased. Cooled slowly in oil from 425° F.; seventh annealing.

40,000	0	73,000	a b c	.1997 .2004 .2002	.1698 .1703 .1701	.1994 .2000 .1999	.0296 .0297 .0288	.0003 .0004 .0003
	1,000	74,000	a b c	.2010 .2008 .2028	.1647 .1664 .1673	.1958 .1971 .1978	.0311 .0307 .0305	.0052 .0037 .0050
	1,000	75,000	a b c	.1929 .2051 .2044	.1608 .1647 .1651	.1920 .1958 .1962	.0312 .0311 .0311	.0009 .0093 .0082
	1,000	76,000	a b c	.2057 .2006 .2052	.1611 .1627 .1637	.1931 .1942 .1950	.0320 .0315 .0313	.0126 .0067 .0102
	7,000	83,000	a b c	.1933 .2132 .2050	.1559 .1641 .1604	.1985 .1960 .1926	.0326 .0319 .0322	.0048 .0172 .0124
40,000	0	83,000	a b c	.2004 .2002 .1988	.1701 .1694 .1676	.2002 .1999 .1981	.0301 .0305 .0305	.0002 .0003 .0007
	1,000	84,000	a b c	.2040 .2047 .2016	.1654 .1654 .1626	.1951 .1969 .1942	.0317 .0315 .0316	.0089 .0078 .0074
	1,000	85,000	a b c	.2025 .2080 .2034	.1603 .1639 .1607	.1924 .1958 .1929	.0321 .0310 .0322	.0101 .0122 .0105
	1,000	86,000	a b c	.1909 .2011 .2078	.1576 .1611 .1605	.1896 .1931 .1931	.0320 .0320 .0326	.0013 .0080 .0147
	5,750	91,750						
Bar ruptured								

Bar heated to temperature of 425° F. in oil and maintained 1 hour; then slowly cooled in warm shavings; eighth anneal-  
ing.

No. 48.—Wrought-iron bar (*Burden's*). *Mark, 2.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	<i>a</i>	<i>Inch.</i> .1994	<i>Inch.</i> .1691	<i>Inch.</i> .1991	<i>Inch.</i> .0300	<i>Inch.</i> .0003	Bar annealed at temperature of 425° F.; first annealing.
			<i>b</i>	.1988	.1683	.1881	.0298	.0007	
			<i>c</i>	.1995	.1689	.1889	.0300	.0006	
	20,000	20,000	<i>a</i>	.1925	.1618	.1921	.0303	.0004	
			<i>b</i>	.1873	.1550	.1853	.0302	.0020	
			<i>c</i>	.2178	.1784	.2061	.0297	.0097	
	0	20,000	<i>a</i>	.1998	.1698	.1995	.0297	.0003	
			<i>b</i>	.1982	.1676	.1974	.0298	.0008	
			<i>c</i>	.2000	.1698	.1996	.0298	.0004	
	20,000	40,000	<i>a</i>	.1925	.1602	.1904	.0302	.0021	
			<i>b</i>	.2151	.1671	.1972	.0301	.0179	
			<i>c</i>	.2006	.1616	.1926	.0310	.0089	
	0	40,000	<i>a</i>	.1971	.1671	.1969	.0298	.0002	Bar annealed at temperature of 425° F.; second annealing.
			<i>b</i>	.1992	.1689	.1988	.0298	.0004	
			<i>c</i>	.2010	.1707	.2005	.0298	.0005	
	17,500	57,500							

Bar ruptured.

NO. 49.—*Wrought-iron bar (Burden's). Mark, 2.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 40,000	0	0	a b c	Inch. .1995 .2001 .1997	Inch. .1693 .1697 .1694	Inch. .1991 .1995 .1992	Inch. .0298 .0298 .0298	Inch. .0004 .0006 .0005	
	30,000	30,000	a b c	.2004 .1886 .2133	.1654 .1538 .1725	.1957 .1860 .2026	.0303 .0312 .0301	.0047 .0036 .0107	
	0	30,000	a b c	.1972 .2014 .2001	.1672 .1706 .1698	.1970 .2011 .1998	.0296 .0305 .0300	.0002 .0003 .0003	Bar annealed at temperature of 425° F.; exposed to temper- ature of bath about 5 minutes.
	18,100	48,100							Bar ruptured.

**TEST NO. 36.—*Wrought-iron shaft from rod No. 3.***

The test began with 20,000 pounds per square inch fiber stress, which was increased by 1,000 pounds per square inch increments after successive runs of 5,000 rotations.

Permanent sets, very slight at first, increased rapidly with loads at and above 27,000 pounds per square inch.

After the sets had reached considerable magnitude the bar was warmed while running, reaching a temperature at 90,000 rotations painful to the touch.

After 95,000 rotations the shaft rested without load a period of 4 days, resulting in a temporary and partial reduction of the sets.

Continuing the test the shaft ruptured at 129,500 rotations.

No. 36.—*Wrought-iron bar (Burden's). Mark, 3.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
20,000 <i>Pounds.</i>	0	0	<i>a</i>	Inch. .1998 .1999 .1997 .1992	Inch. .1863 .1849 .1844	Inch. .1998 .1998 .1997 .1992	Inch. 0. 0. .0145 .0148 .0148		
	5,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.1999 .1998 .1993	.1852 .1851 .1843	.1998 .1997 .1992	.0146 .0146 .0149 .0001 .0001 .0001		
	0	0	<i>a</i> <i>b</i> <i>c</i>	.1999 .2000 .1994	.1843 .1843 .1838	.1998 .1998 .1993	.0155 .0155 .0155 .0001 .0002 .0002 .0001		
	5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.1999 .2000 .1993	.1843 .1844 .1837	.1998 .1998 .1992	.0155 .0154 .0155		
22,000	0	10,000	<i>a</i> <i>b</i> <i>c</i>	.2000 .2000 .1994	.1835 .1836 .1829	.1998 .1998 .1993	.0163 .0162 .0164 .0002 .0002 .0001		
	5,000	15,000	<i>a</i> <i>b</i> <i>c</i>	.1998 .2000 .1993	.1835 .1837 .1829	.1998 .1998 .1993	0. 0. .0161 .0164		
	0	15,000	<i>a</i> <i>b</i> <i>c</i>	.2000 .1999 .1994	.1828 .1828 .1822	.1998 .1998 .1993	.0170 .0170 .0171 .0002 .0001 .0001		
	5,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.2001 .2000 .1994	.1826 .1828 .1824	.1998 .1998 .1993	.0172 .0170 .0169 .0003 .0002 .0001		
24,000	0	20,000	<i>a</i> <i>b</i> <i>c</i>	.2000 .2000 .1994	.1822 .1822 .1814	.1998 .1997 .1991	.0176 .0175 .0177 .0002 .0003 .0003		

No. 36.—*Wrought-iron bar (Burden's). Mark, 3—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets. <i>Inch.</i>	Remarks.
	Successive.	Total.	On line.	Unloaded.		Loaded.			
				<i>Inch.</i>		<i>Inch.</i>	<i>Inch.</i>		
<i>Pounds.</i> 25,000	5,000	25,000	a	.2001		.1819	.1997	.0178	
			b	.1993		.1818	.1996	.0178	
			c	.1994		.1815	.1991	.0176	
25,000	0	25,000	a	.2000		.1813	.1997	.0184	
			b	.2002		.1812	.1997	.0185	
			c	.1996		.1805	.1992	.0186	
26,000	5,000	30,000	a	.1997		.1808	.1995	.0190	
			b	.2005		.1812	.1994	.0192	
			c	.1995		.1805	.1990	.0192	
26,000	0	30,000	a	.2001		.1806	.1996	.0190	
			b	.2003		.1803	.1995	.0192	
			c	.1995		.1798	.1990	.0192	
27,000	5,000	35,000	a	.1994		.1802	.1993	.0191	
			b	.2009		.1803	.1993	.0190	
			c	.1998		.1798	.1989	.0191	
27,000	0	35,000	a	.2003		.1794	.1994	.0200	
			b	.2006		.1793	.1992	.0199	
			c	.1998		.1788	.1989	.0201	
28,000	5,000	40,000	a	.1994		.1789	.1990	.0201	
			b	.2013		.1790	.1988	.0198	
			c	.1999		.1788	.1987	.0199	
28,000	0	40,000	a	.2005		.1787	.1993	.0206	
			b	.2009		.1779	.1986	.0207	
			c	.2002		.1780	.1987	.0207	
28,000	5,000	45,000	a	.1987		.1778	.1985	.0207	
			b	.2005		.1773	.1980	.0207	
			c	.2006		.1776	.1983	.0207	
28,000	0	45,000	a	.2009		.1781	.1994	.0213	
			b	.2010		.1775	.1987	.0212	
			c	.1998		.1770	.1984	.0214	



30,000	5,000	50,000	a	.2009 .2017 .2006	.1769 .1762 .1765	.1985 .1978 .1980	.0216 .0216 .0215	.0024 .0039 .0026
	0	50,000	a b c	.2012 .2015 .2008	.1761 .1753 .1756	.1986 .1975 .1979	.0225 .0222 .0223	.0026 .0040 .0029
	5,000	55,000	a b c	.1975 .2011 .2018	.1745 .1744 .1750	.1973 .1968 .1974	.0228 .0224 .0224	.0002 .0043 .0044
31,000	0	55,000	a b c	.2015 .2020 .2014	.1749 .1735 .1742	.1980 .1967 .1973	.0231 .0232 .0231	.0035 .0041 .0041
	5,000	60,000	a b c	.1983 .1988 .2030	.1738 .1726 .1738	.1971 .1957 .1969	.0233 .0231 .0231	.0012 .0041 .0061
32,000	0	60,000	a b c	.2018 .2024 .2022	.1734 .1717 .1725	.1974 .1958 .1965	.0240 .0241 .0240	.0044 .0066 .0057
	5,000	65,000	a b c	.1967 .1998 .2040	.1714 .1700 .1721	.1959 .1945 .1962	.0245 .0245 .0241	.0008 .0054 .0078
23,000	0	65,000	a b c	.2030 .2024 .2029	.1719 .1698 .1712	.1969 .1948 .1959	.0250 .0250 .0247	.0061 .0076 .0070
	5,000	70,000	a b c	.2047 .2041 .2024	.1709 .1698 .1702	.1962 .1949 .1952	.0255 .0251 .0250	.0085 .0092 .0072
24,000	0	70,000	a b c	.2032 .2035 .2034	.1703 .1685 .1694	.1963 .1944 .1953	.0260 .0239 .0259	.0069 .0081 .0081
	5,000	75,000	a b c	.1932 .2045 .2038	.1684 .1672 .1699	.1923 .1932 .1956	.0259 .0260 .0257	.0009 .0113 .0102
25,000	0	75,000	a b c	.2033 .2043 .2036	.1689 .1673 .1687	.1954 .1939 .1950	.0265 .0266 .0263	.0079 .0104 .0086
	5,000	80,000	a b c	.2075 .2012 .2036	.1693 .1660 .1681	.1963 .1932 .1948	.0270 .0272 .0267	.0112 .0080 .0038

No. 36.—Wrought-iron bar (*Burden's*). Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds. 36,000	0	80,000	a	Inch. .1954	Inch. .1688	Inch. .1953	Inch. .0265	Inch. .0001	Bar quite hot, so that it pained the hand. Cooled with water before measuring.
			b	.2043	.1726	.1990	.0264	.0053	
			c	.2018	.1705	.1971	.0266	.0047	
5,000		85,000	a	.1990	.1652	.1931	.0279	.0059	
			b	.1980	.1620	.1901	.0281	.0079	
			c	.2094	.1668	.1946	.0278	.0148	
0		85,000	a	.2049	.1660	.1947	.0287	.0102	
			b	.2048	.1633	.1919	.0286	.0129	
			c	.2049	.1656	.1940	.0284	.0109	
5,000		90,000	a	.1923	.1633	.1918	.0285	.0005	
			b	.1980	.1638	.1917	.0279	.0053	
			c	.2098	.1675	.1955	.0280	.0143	
0		90,000	a	.2030	.1646	.1939	.0293	.0091	Bar quite hot, so that it pained the hand. Cooled with water before measuring.
			b	.2050	.1658	.1929	.0281	.0121	
			c	.2054	.1654	.1947	.0293	.0107	
5,000		95,000	a	.1874	.1561	.1870	.0299	.0004	
			b	.2085	.1654	.1938	.0284	.0147	
			c	.2088	.1672	.1959	.0287	.0129	
0		95,000	a	.2003	.1698	.1930	.0282	.0028	
			b	.2036	.1723	.2003	.0280	.0033	
			c	.1968	.1677	.1962	.0285	.0026	
200		95,200	a	.2037	.1657	.1951	.0294	.0036	Bar rested 4 days.
			b	.2040	.1669	.1962	.0293	.0078	
			c	.2028	.1662	.1955	.0298	.0073	
200		95,400	a	.2043	.1651	.1945	.0294	.0093	
			b	.2048	.1658	.1953	.0295	.0095	
			c	.2034	.1656	.1951	.0295	.0083	
200		95,600	a	.1982	.1628	.1934	.0296	.0028	
			b	.2090	.1652	.1947	.0295	.0143	
			c	.2041	.1651	.1947	.0296	.0094	

39,000	200	95,800	a b c	.1955 .2002 .2069	.1637 .1638 .1657	.1931 .1933 .1953	.0294 .0295 .0296	.0024 .0069 .0116
	200	96,000	a b c	.1953 .2006 .2067	.1634 .1637 .1654	.1932 .1933 .1959	.0298 .0296 .0296	.0021 .0073 .0117
	0	96,000	a b c	.2022 .2054 .2052	.1636 .1632 .1640	.1940 .1936 .1946	.0304 .0304 .0306	.0092 .0118 .0106
	4,000	100,000	a b c	.1976 .1951 .2137	.1598 .1564 .1639	.1904 .1868 .1945	.0306 .0304 .0306	.0072 .0083 .0192
40,000	0	100,000	a b c	.2056 .2058 .2084	.1604 .1582 .1616	.1920 .1897 .1931	.0316 .0315 .0315	.0136 .0161 .0153
	5,000	105,000	a b c	.1945 .2211 .1963	.1604 .1682 .1559	.1906 .1891 .1871	.0302 .0290 .0312	.0039 .0220 .0092
41,000	0	105,000	a b c	.2050 .2118 .1997	.1630 .1634 .1558	.1949 .1953 .1879	.0319 .0321 .0321	.0101 .0165 .0118
	5,000	110,000	a b c	.2062 .1821 .2154	.1692 .1474 .1714	.2005 .1786 .2021	.0313 .0312 .0307	.0057 .0035 .0133
42,000	0	110,000	a b c	.2088 .1918 .2103	.1680 .1500 .1673	.2003 .1823 .1998	.0323 .0323 .0325	.0085 .0095 .0105
	5,000	115,000	a b c	.1946 .1836 .2222	.1618 .1497 .1776	.1937 .1808 .2090	.0319 .0311 .0286	.0009 .0028 .0132
43,000	0	115,000	a b c	.2014 .1909 .2154	.1617 .1513 .1729	.1960 .1841 .2050	.0343 .0328 .0330	.0054 .0068 .0095
	5,000	120,000	a b c	.2007 .1773 .2243	.1638 .1408 .1770	.1973 .1733 .2091	.0340 .0325 .0321	.0029 .0040 .0152
44,000	0	120,000	a b c	.2068 .1864 .2162	.1658 .1443 .1727	.1995 .1780 .2062	.0337 .0337 .0335	.0073 .0084 .0100

No. 36.—Wrought-iron bar (*Burden's*). Mark, 3—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.		
<i>Pounds.</i>								
45,000	5,000	125,000	a b c	<i>Inch.</i> .2161 .2132 .1841	<i>Inch.</i> .1728 .1711 .1391	<i>Inch.</i> .2058 .2044 .1778	<i>Inch.</i> .0103 .0088 .0063	
	0	125,000	a b c	.2113 .2116 .1859	.1701 .1686 .1438	.2041 .2030 .1785	.0240 .0344 .0347	
	4,500	129,500	.....	.....	.....	.....	.....	Bar ruptured.

No. 37.—*Wrought-iron bar (Burden's). Mark, 3.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	<i>a</i>	<i>Inch.</i> .2001	<i>Inch.</i> .1691	<i>Inch.</i> .1994	<i>Inch.</i> .0303	<i>Inch.</i> .0007	Temperature of bar increased rapidly.
			<i>b</i>	.2001	.1696	.1996	.0300	.0005	
			<i>c</i>	.2004	.1696	.1992	.0296	.0012	
	1,000	1,000	<i>a</i>	.1759	.1408	.1724	.0316	.0035	
			<i>b</i>	.2118	.1572	.1869	.0297	.0249	
			<i>c</i>	.2225	.1533	.1846	.0313	.0379	
	1,000	2,000	<i>a</i>	.2123	.1598	.1905	.0307	.0217	
			<i>b</i>	.2185	.1637	.1945	.0308	.0240	
			<i>c</i>	.2083	.1479	.1798	.0319	.0285	
	1,000	3,000	<i>a</i>	.2211	.1610	.1926	.0316	.0285	
			<i>b</i>	.2017	.1580	.1894	.0314	.0123	
			<i>c</i>	.2090	.1528	.1843	.0315	.0247	
	1,000	4,000	<i>a</i>	.1986	.1534	.1849	.0315	.0137	
			<i>b</i>	.2235	.1646	.1955	.0309	.0270	
			<i>c</i>	.2087	.1506	.1822	.0314	.0245	
	1,000	5,000	<i>a</i>	.1891	.1491	.1810	.0319	.0081	
			<i>b</i>	.1948	.1540	.1849	.0309	.0099	
			<i>c</i>	.2241	.1559	.1873	.0314	.0368	
	5,000	10,000	<i>a</i>	.2140	.1743	.2042	.0289	.0098	Bar hot; painful to the touch. Cooled with water before measuring.
			<i>b</i>	.2124	.1744	.2044	.0300	.0080	
			<i>c</i>	.1888	.1555	.1813	.0258	.0075	
	10,000	20,000	<i>a</i>	.2075	.1710	.2008	.0298	.0087	
			<i>b</i>	.2152	.1775	.2076	.0301	.0076	
			<i>c</i>	.1876	.1520	.1823	.0303	.0053	
	10,000	30,000	<i>a</i>	.2084	.1714	.2018	.0394	.0066	
			<i>b</i>	.1862	.1533	.1838	.0305	.0024	
			<i>c</i>	.2119	.1715	.2017	.0302	.0102	



No. 38.—*Wrought-iron bar (Barden's). Mark, 3.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	<i>a</i>	<i>Inch.</i> .1988 .1990 .1997	<i>Inch.</i> .1691 .1684 .1686	<i>Inch.</i> .1985 .1983 .1984	<i>Inch.</i> .0294 .0290 .0298	<i>Inch.</i> .0003 .0007 .0013	Temperature of bar increased rapidly.
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.2208 .2150 .2073	.1553 .1566 .1470	.1864 .1877 .1768	.0311 .0311 .0318	.0344 .0273 .0285	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.2057 .1966 .2142	.1593 .1517 .1553	.1902 .1832 .1863	.0309 .0315 .0310	.0155 .0154 .0279	
1,000	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1983 .2162 .2040	.1555 .1624 .1497	.1868 .1831 .1814	.0343 .0307 .0317	.0115 .0231 .0226	Bar hot; painful to the touch. Cooled with water.
	1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.1833 .1927 .2216	.1500 .1539 .1590	.1815 .1847 .1898	.0315 .0308 .0308	.0018 .0080 .0318	
	1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.1889 .2183 .2080	.1517 .1619 .1539	.1831 .1928 .1855	.0314 .0309 .0316	.0058 .0255 .0225	
5,000	5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.1976 .1860 .2163	.1648 .1585 .1793	.1949 .1838 .2086	.0301 .0303 .0293	.0027 .0022 .0077	Bar ruptured.
	10,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.1918 .1860 .2195	.1594 .1546 .1739	.1913 .1846 .2082	.0319 .0300 .0293	.0005 .0014 .0713	
	10,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.2138 .2073 .1890	.1743 .1707 .1519	.2038 .2011 .1826	.0295 .0304 .0307	.0100 .0082 .0064	
7,200	7,200	37,200							

No. 39.—*Wrought-iron bar (Burden's). Mark, 3.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	•	0	<i>a</i>	<i>Inch.</i> .1986	<i>Inch.</i> .1701	<i>Inch.</i> .1888	<i>Inch.</i> .0287	<i>Inch.</i> .0008	Bar very hot. Cooled with water.
			<i>b</i>	.2004	.1701	.1985	.0294	.0009	
			<i>c</i>	.2004	.1696	.1994	.0298	.0010	
1,000	1,000	<i>a</i>	.1951	.1565	.1870	.0305	.0081		
		<i>b</i>	.1878	.1456	.1766	.0310	.0112		
		<i>c</i>	.2250	.1675	.1974	.0299	.0276		
1,000	2,000	<i>a</i>	.1913	.1564	.1868	.0304	.0045		
		<i>b</i>	.1917	.1495	.1804	.0309	.0113		
		<i>c</i>	.2238	.1692	.1990	.0298	.0248		
1,000	3,000	<i>a</i>	.1876	.1538	.1852	.0314	.0024		
		<i>b</i>	.1920	.1516	.1825	.0309	.0095		
		<i>c</i>	.2228	.1688	.1965	.0300	.0242		
1,000	4,000	<i>a</i>	.2212	.1619	.1973	.0354	.0239		
		<i>b</i>	.2037	.1875	.1885	.0310	.0152		
		<i>c</i>	.2048	.1563	.1896	.0313	.0152		
1,000	5,000	<i>a</i>	.1847	.1494	.1808	.0314	.0039		
		<i>b</i>	.2232	.1576	.1890	.0314	.0342		
		<i>c</i>	.2124	.1621	.1985	.0314	.0189		
5,000	10,000	<i>a</i>	.2019	.1654	.1951	.0297	.0068		
		<i>b</i>	.2185	.1734	.2032	.0298	.0153		
		<i>c</i>	.1945	.1553	.1862	.0309	.0033		
10,000	20,000	<i>a</i>	.2042	.1676	.1975	.0299	.0067		
		<i>b</i>	.2166	.1763	.2051	.0296	.0107		
		<i>c</i>	.1924	.1554	.1861	.0307	.0063		
11,000	31,000	<i>a</i>	.1935	.1629	.1932	.0303	.0003		
		<i>b</i>	.1889	.1573	.1874	.0301	.0015		
		<i>c</i>	.2181	.1790	.2068	.0298	.0093		
								Rested 13 days.	



Bar straightened and then annealed at temperature of 599° F.

0	31,000	a b c	2003 .1994 .2013	.1700 .1691 .1709	.1999 .1988 .2008	.0299 .0297 .0299	.0004 .0006 .0005
1,000	32,000	a b c	.2053 .1998 .2067	.1642 .1613 .1675	.1953 .1923 .1985	.0311 .0310 .0310	.0103 .0075 .0082
1,000	33,000	a b c	.2040 .2032 .2069	.1628 .1612 .1669	.1938 .1922 .1980	.0310 .0310 .0311	.0102 .0180 .0089
1,000	34,000	a b c	.2073 .2011 .2081	.1633 .1594 .1664	.1943 .1907 .1973	.0310 .0313 .0309	.0130 .0104 .0108
1,000	35,000	a b c	.1979 .1988 .2120	.1604 .1567 .1661	.1915 .1883 .1972	.0311 .0316 .0311	.0064 .0105 .0148
5,800	40,000	a b c	.1978 .2154 .2056	.1579 .1615 .1609	.1594 .1924 .1928	.0315 .0309 .0319	.0034 .0230 .0128
10,000	50,000	a b	.2136 .1858 .2112	.1724 .1490 .1663	.2035 .1806 .1993	.0311 .0316 .0330	.0101 .0052 .0119
1,500	51,500						

Bar ruptured.

No. 40.—*Wrought-iron bar (Burden's). Mark, 3.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	a	<i>Inch.</i> .2004 .1702 .2004 .2005	<i>Inch.</i> .1702 .1691 .1695	<i>Inch.</i> .2000 .1990 .1995	<i>Inch.</i> .0298 .0299 .0300	<i>Inch.</i> .0004 .0014 .0010	
	1,000	1,000	a b c	.1798 .2304 .2171	.1418 .1543 .1586	.1732 .1853 .1898	.0314 .0310 .0312	.0066 .0451 .0273	
	1,000	2,000	a b c	.2078 .1923 .2155	.1654 .1474 .1653	.1958 .1788 .1958	.0304 .0314 .0305	.0120 .0135 .0197	
	1,000	3,000	a b c	.1843 .1977 .2225	.1581 .1480 .1613	.1828 .1797 .1925	.0267 .0317 .0312	.0015 .0180 .0300	
	1,000	4,000	a b c	.1769 .2208 .2174	.1440 .1598 .1625	.1753 .1806 .1984	.0313 .0308 .0359	.0016 .0342 .0190	
	1,000	5,000	a b c	.1968 .2234 .2068	.1533 .1664 .1562	.1858 .1897 .1881	.0325 .0337 .0319	.0110 .0337 .0187	
	5,000	10,000	a b c	.2180 .2044 .1918	.1768 .1674 .1550	.2067 .1976 .1859	.0299 .0302 .0309	.0113 .0068 .0059	
	10,000	20,000	a b c	.1885 .2241 .1953	.1563 .1815 .1597	.1864 .2113 .1906	.0301 .0298 .0309	.0021 .0128 .0047	
	0	20,000	a b c	.1987 .2017 .2006	.1638 .1715 .1699	.1980 .2014 .1998	.0292 .0299 .0299	.0007 .0003 .0008	Bar straightened and then annealed at temperature of 598° F.

1,000	21,000	a	210	1623	1931	0308	0079
		a		1619	1978	0359	0109
		b		2087	1978	0312	0073
		c	2031	1646	1958		
1,000	22,000	a	1895	1569	1882	0313	0013
		b	2108	1627	1941	0314	0187
		c	2069	1640	1953	0313	0116
1,000	23,000	a	2091	1610	1927	0317	0164
		b	2145	1600	1920	0320	0125
		c	2063	1621	1939	0318	0124
1,000	24,000	a	2105	1602	1922	0320	0183
		b	2048	1586	1906	0320	0142
		c	2070	1613	1931	0318	0139
1,000	25,000	a	1937	1575	1894	0319	0043
		b	1997	1577	1877	0321	0120
		c	2119	1556	1941		
5,000	30,000	a	2162	1655	1970	0315	0192
		b	1973	1658	1876	0318	0087
		c	2062	1611	1933	0322	0129
9,400	39,400						Bar ruptured.

No. 60.—*Wrought-iron bar (Burden's). Mark, 4.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 25,000	0	0	<i>a</i>	<i>Inch.</i> .1998 .2005 .2003	<i>Inch.</i> .1731 .1736 .1731	<i>Inch.</i> .1998 .2001 .1996	<i>Inch.</i> .0285 .0285 .0285	<i>Inch.</i> .0002 .0004 .0004	
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.1947 .2028 .2057	.1687 .1685 .1676	.1837 .1855 .1947	.0270 .0270 .0271	.0010 .0073 .0110	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1941 .2019 .2065	.1659 .1678 .1676	.1833 .1949 .1947	.0274 .0271 .0271	.0008 .0070 .0118	
1,000	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1996 .1989 .2083	.1681 .1663 .1677	.1834 .1834 .1948	.0273 .0271 .0271	.0062 .0055 .0135	
	1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.2056 .2017 .2054	.1683 .1681 .1677	.1955 .1951 .1948	.0272 .0270 .0271	.0101 .0066 .0106	
	1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2051 .2011 .2048	.1682 .1685 .1677	.1956 .1954 .1949	.0274 .0269 .0272	.0095 .0057 .0099	
5,000	5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.2054 .2029 .2037	.1687 .1694 .1684	.1961 .1964 .1956	.0274 .0270 .0272	.0093 .0065 .0081	
	10,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.2020 .1996 .2055	.1680 .1679 .1691	.1056 .1852 .1965	.0276 .0273 .0274	.0064 .0044 .0090	
	10,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.1968 .2052 .2035	.1179 .1971 .1695	.1951 .1971 .1966	.0272 .0271 .0271	.0017 .0081 .0069	

10,000	40,000	a b c	.2008 .2044 .2027	.1685 .1700 .1689	.1961 .1972 .1963	.0276 .0272 .0274	.0047 .0072 .0064
10,000	50,000	a b c	.1948 .2034 .2048	.1686 .1697 .1698	.1941 .1967 .1968	.0275 .0270 .0270	.0007 .0067 .0080
10,000	60,000	a b c	.1949 .2034 .2045	.1689 .1699 .1698	.1943 .1969 .1968	.0274 .0270 .0271	.0006 .0065 .0076
10,000	70,000	a b c	.1963 .2047 .2034	.1675 .1698 .1694	.1950 .1972 .1968	.0275 .0274 .0274	.0013 .0075 .0066
10,000	80,000	a b c	.1981 .2040 .2026	.1688 .1706 .1696	.1963 .1978 .1968	.0275 .0272 .0272	.0018 .0062 .0057
10,000	90,000	a b c	.1966 .2015 .2041	.1677 .1698 .1697	.1953 .1972 .1971	.0276 .0274 .0274	.0003 .0043 .0070
10,000	100,000	a b c	.2035 .2034 .2027	.1690 .1701 .1691	.1966 .1976 .1968	.0276 .0275 .0275	.0069 .0058 .0061
10,000	110,000	a b c	.1953 .2028 .2039	.1673 .1697 .1685	.1948 .1972 .1969	.0275 .0275 .0274	.0005 .0056 .0070
10,000	120,000	a b c	.1991 .2046 .2026	.1686 .1701 .1692	.1963 .1976 .1967	.0277 .0275 .0275	.0028 .0070 .0059
10,000	130,000	a b c	.2018 .2098 .2043	.1685 .1684 .1695	.1963 .1961 .1970	.0278 .0277 .0275	.0055 .0037 .0073
10,000	140,000	a b c	.1959 .2031 .2041	.1673 .1688 .1696	.1951 .1966 .1971	.0278 .0278 .0275	.0008 .0065 .0070
10,000	150,000	a b c	.1967 .2034 .2050	.1670 .1640 .1684	.1956 .1934 .1964	.0286 .0294 .0280	.0011 .0100 .0086
2,850	152,850						

Bar ruptured.

No. 61.—*Wrought-iron bar (Burden's). Mark, 4.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Deflections.  <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.		Loaded.	Unloaded.			
				<i>Inch.</i>	<i>Inch.</i>					
<i>Pounds.</i> 35,000	0	0	<i>a</i>	.2006 .1740 .2005 .2005	.2004 .1737 .1736	.2004 .2001 .1998	.0264 .0264 .0262	.0002 .0004 .0007		
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.1964 .1997 .2078	.1669 .1678 .1684	.1939 .1848 .1954	.0270 .0270 .0270	.0025 .0049 .0124		
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.1944 .2017 .2067	.1663 .1682 .1684	.1936 .1951 .1954	.0273 .0269 .0270	.0008 .0066 .0113		
1,000	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1946 .2055 .2059	.1658 .1690 .1687	.1930 .1859 .1957	.0272 .0269 .0270	.0016 .0096 .0102		
1,000	1,000	4,000	<i>a</i> <i>b</i> <i>c</i>	.1976 .2000 .2081	.1664 .1675 .1689	.1936 .1948 .1959	.0272 .0271 .0270	.0040 .0054 .0122		
1,000	1,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.1944 .2012 .2070	.1665 .1683 .1691	.1938 .1953 .1961	.0273 .0270 .0270	.0006 .0059 .0109		
5,000	5,000	10,000	<i>a</i> <i>b</i> <i>c</i>	.2043 .2045 .2038	.1685 .1698 .1693	.1959 .1969 .1964	.0274 .0271 .0271	.0084 .0076 .0074		
10,000	10,000	20,000	<i>a</i> <i>b</i> <i>c</i>	.2038 .2016 .2027	.1701 .1709 .1704	.1973 .1979 .1974	.0272 .0270 .0270	.0065 .0037 .0053		
0	0	20,000	<i>a</i> <i>b</i> <i>c</i>	.2011 .2012 .2008	.1729 .1737 .1735	.1995 .2000 .1997	.0266 .0263 .0262	.0016 .0012 .0011		Bar rested 35 days.

1,000	a	1989	.1713	.1979	.0266	.0010
	b	.2009	.1721	.1988	.0269	.0019
	c	.2026	.1721		.0267	.0038
1,000	a	.2030	.1715	.1984	.0269	.0046
	b	.2017	.1723	.1991	.0268	.0026
	c	.2020	.1719	.1987	.0268	.0033
1,000	a	.2028	.1713	.1981	.0268	.0047
	b	.2025	.1722	.1991	.0269	.0034
	c	.2019	.1716	.1984	.0268	.0035
0	a	.2013	.1748	.2010	.0262	.0003
	b	.2003	.1740	.2001	.0261	.0002
	c	.2003	.1739	.2000	.0261	.0003
1,000	a	.1988	.1732	.1986	.0264	.0002
	b	.2006	.1732	.1985	.0263	.0011
	c	.2015	.1729	.1993	.0264	.0022
1,000	a	.2017	.1728	.1994	.0266	.0023
	b	.2018	.1733	.1996	.0263	.0022
	c	.2014	.1725	.1990	.0265	.0024
1,000	a	.1989	.1720	.1983	.0268	.0001
	b	.2010	.1728	.1992	.0264	.0018
	c	.2020	.1724	.1990	.0266	.0030
1,000	a	.1983	.1719	.1987	.0268	.0006
	b	.2023	.1728	.1993	.0265	.0020
	c	.2018	.1722	.1988	.0266	.0030
1,000	a	.1985	.1713	.1982	.0269	.0003
	b	.2013	.1723	.1990	.0267	.0023
	c	.2024	.1719	.1987	.0268	.0037
5,000	a	.2034	.1714	.1985	.0271	.0049
	b	.2020	.1723	.1980	.0267	.0030
	c	.2021	.1717	.1984	.0267	.0037
10,000	a	.2034	.1708	.1979	.0271	.0045
	b	.2032	.1718	.1988	.0270	.0044
	c	.2022	.1709	.1980	.0271	.0042
0	a	.1987	.1733	.1937	.0264	0.
	b	.2008	.1743	.2006	.0263	.0002
	c	.2006	.1741	.2002	.0261	.0004

Bar heated in oil bath to 500° F., and kept at that temperature 1 hour. Cooled slowly in oil bath; first annealing.

Bar annealed same manner as before, at temperature of 500° F.; second annealing.

No. 61.—Wrought-iron bar (*Burden's*). *Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets. <i>Inch.</i>	Remarks.
	Successive.	Total.	On line.	Unloaded. <i>Inch.</i>	Loaded. <i>Inch.</i>	Unloaded. <i>Inch.</i>			
<i>Pounds.</i> 35,000	1,000	44,000	<i>a</i> <i>b</i> <i>c</i>	.1990 .2015 .2014	.1790 .1829 .1728	.1986 .1995 .1993	.0266 .0266 .0265	.0004 .0020 .0021	Bar annealed same manner as before, at temperature of 500° F.; third annealing.
	1,000	45,000	<i>a</i> <i>b</i> <i>c</i>	.1986 .2006 .2019	.1716 .1724 .1724	.1983 .1991 .1989	.0267 .0267 .0265	.0003 .0015 .0030	
	1,000	46,000	<i>a</i> <i>b</i> <i>c</i>	.1999 .2005 .2024	.1713 .1720 .1721	.1982 .1988 .1988	.0269 .0268 .0267	.0017 .0017 .0036	
	1,000	47,000	<i>a</i> <i>b</i> <i>c</i>	.1984 .2006 .2024	.1709 .1719 .1716	.1979 .1984 .1986	.0270 .0269 .0270	.0005 .0018 .0038	
	1,000	48,000	<i>a</i> <i>b</i> <i>c</i>	.1984 .2007 .2024	.1712 .1718 .1717	.1979 .1987 .1985	.0267 .0269 .0268	.0005 .0020 .0039	
	5,000	53,000	<i>a</i> <i>b</i> <i>c</i>	.2013 .2024 .2018	.1710 .1717 .1711	.1981 .1987 .1981	.0271 .0270 .0270	.0032 .0037 .0037	
	10,000	63,000	<i>a</i> <i>b</i> <i>c</i>	.2018 .2004 .2028	.1705 .1708 .1710	.1976 .1979 .1980	.0271 .0271 .0270	.0042 .0025 .0048	
	0	63,000	<i>a</i> <i>b</i> <i>c</i>	.2025 .1985 .2003	.1757 .1722 .1738	.2020 .1984 .1999	.0283 .0262 .0261	.0005 .0001 .0004	
	1,000	64,000	<i>a</i> <i>b</i> <i>c</i>	.2002 .2012 .2013	.1726 .1719 .1724	.1994 .1985 .1989	.0268 .0266 .0265	.0008 .0027 .0024	
	1,000	65,000	<i>a</i> <i>b</i> <i>c</i>	.1992 .2016 .2018	.1721 .1718 .1720	.1987 .1984 .1987	.0266 .0265 .0267	.0005 .0032 .0031	



1,000	66,000	a	1,894	.1715	.1985	.0270	.0009
1,000	67,000	b	.2020	.1718	.1985	.0267	.0035
		c	.2018	.1716	.1986	.0266	.0032
		a	.2016	.1718	.1986	.0268	.0030
1,000	68,000	b	.2019	.1719	.1986	.0267	.0033
		c	.2016	.1716	.1985	.0269	.0031
		a	.2016	.1714	.1984	.0270	.0032
1,000	68,000	b	.2001	.1712	.1980	.0268	.0021
		c	.2024	.1715	.1985	.0270	.0039
		a	.2011	.1712	.1981	.0269	.0030
5,000	73,000	b	.2023	.1715	.1985	.0270	.0038
		c	.2019	.1711	.1981	.0270	.0038
10,000	83,000	a	.2020	.1724	.1988	.0264	.0032
		b	.1996	.1712	.1979	.0267	.0017
		c	.2025	.1725	.1989	.0264	.0036
0	83,000	a	.2003	.1738	.2002	.0264	.0001
		b	.2002	.1737	.2000	.0263	.0002
		c	.2010	.1744	.2006	.0262	.0004
1,000	84,000	a	.1990	.1720	.1988	.0268	.0002
		b	.2005	.1721	.1989	.0268	.0016
		c	.2022	.1728	.1994	.0266	.0028
1,000	85,000	a	.2008	.1721	.1989	.0268	.0014
		b	.2018	.1721	.1989	.0268	.0029
		c	.2016	.1725	.1991	.0266	.0025
1,000	86,000	a	.1986	.1713	.1983	.0270	.0003
		b	.2017	.1721	.1984	.0263	.0033
		c	.2022	.1725	.1990	.0265	.0032
1,000	87,000	a	.2021	.1717	.1987	.0270	.0034
		b	.2006	.1715	.1986	.0271	.0029
		c	.2020	.1720	.1989	.0269	.0031
1,000	88,000	a	.1996	.1716	.1985	.0269	.0011
		b	.2022	.1719	.1986	.0267	.0036
		c	.2019	.1718	.1987	.0269	.0032
5,000	93,000	a	.1980	.1707	.1976	.0269	.0004
		b	.2016	.1715	.1985	.0270	.0031
		c	.2025	.1718	.1986	.0268	.0039

Rested 15 hours.

Bar annealed same manner as before, at temperature of 500° F.; fourth annealing.

No. 61.—*Wrought-iron bar (Burden's). Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds</i> 35,000	10,000	103,000	<i>a</i> <i>b</i> <i>c</i>	<i>Inch.</i> .2031 .2013 .2019	<i>Inch.</i> .1715 .1715 .1716	<i>Inch.</i> .1984 .1985 .1984	<i>Inch.</i> .0269 .0270 .0268	<i>Inch.</i> .0047 .0028 .0035	Bar annealed same manner as before at temperature of 500° F.; fifth annealing.
0	103,000		<i>a</i> <i>b</i> <i>c</i>	.2004 .2006 .2007	.1738 .1739 .1739	.2003 .2003 .2002	.0265 .0264 .0263	.0001 .0003 .0005	
1,000	104,000		<i>a</i> <i>b</i> <i>c</i>	.2021 .2008 .2015	.1723 .1725 .1724	.1992 .1991 .1990	.0269 .0266 .0266	.0029 .0017 .0025	
1,000	105,000		<i>a</i> <i>b</i> <i>c</i>	.2028 .2015 .2016	.1722 .1722 .1721	.1990 .1990 .1989	.0268 .0268 .0268	.0038 .0025 .0027	
1,000	106,000		<i>a</i> <i>b</i> <i>c</i>	.1985 .2017 .2022	.1714 .1720 .1719	.1981 .1989 .1989	.0267 .0268 .0270	.0040 .0028 .0033	
1,000	107,000		<i>a</i> <i>b</i> <i>c</i>	.1982 .2015 .2023	.1712 .1721 .1719	.1979 .1988 .1987	.0267 .0267 .0266	.0003 .0027 .0036	
1,000	108,000		<i>a</i> <i>b</i> <i>c</i>	.1988 .2005 .2027	.1712 .1717 .1719	.1981 .1986 .1987	.0269 .0269 .0268	.0007 .0019 .0040	
5,000	113,000 <sup>1</sup>		<i>a</i> <i>b</i> <i>c</i>	.1999 .2004 .2031	.1708 .1713 .1717	.1979 .1983 .1987	.0271 .0270 .0270	.0020 .0021 .0044	
10,000	123,000		<i>a</i> <i>b</i> <i>c</i>	.1977 .2010 .2030	.1704 .1713 .1717	.1975 .1984 .1987	.0271 .0271 .0270	.0002 .0026 .0043	
0	123,000		<i>a</i> <i>b</i> <i>c</i>	.2001 .2008 .2008	.1735 .1740 .1742	.2000 .2005 .2004	.0265 .0265 .0262	.0001 .0003 .0004	Bar annealed same manner as before at temperature of 500° F.; sixth annealing.

[illegible]

No. 62.—*Wrought-iron bar (Burden's). Mark, 4.*  
 Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 35,000	0	0	<i>a</i>	<i>Inch.</i> .1899	<i>Inch.</i> .1734	<i>Inch.</i> .1936	<i>Inch.</i> .0262	<i>Inch.</i> .0008	
			<i>b</i>	.1899	.1733	.1935	.0262	.0004	
			<i>c</i>	.2000	.1732	.1935	.0265	.0005	
	1,000	1,000	<i>a</i>	.1950	.1673	.1944	.0271	.0006	
			<i>b</i>	.2014	.1662	.1933	.0271	.0081	
			<i>c</i>	.2053	.1698	.1968	.0270	.0085	
	1,000	2,000	<i>a</i>	.1992	.1674	.1946	.0272	.0046	
			<i>b</i>	.1990	.1650	.1921	.0271	.0069	
			<i>c</i>	.2067	.1695	.1965	.0270	.0102	
	1,000	3,000	<i>a</i>	.2029	.1683	.1955	.0272	.0074	
			<i>b</i>	.1985	.1648	.1920	.0272	.0065	
			<i>c</i>	.2061	.1696	.1966	.0270	.0095	
	1,000	4,000	<i>a</i>	.1979	.1673	.1945	.0272	.0034	
			<i>b</i>	.1993	.1654	.1925	.0271	.0068	
			<i>c</i>	.2064	.1698	.1968	.0270	.0098	
	1,000	5,000	<i>a</i>	.2002	.1674	.1947	.0273	.0055	
			<i>b</i>	.1986	.1649	.1921	.0273	.0065	
			<i>c</i>	.2068	.1698	.1966	.0270	.0100	
	5,000	10,000	<i>a</i>	.1944	.1656	.1932	.0276	.0012	
			<i>b</i>	.2053	.1672	.1944	.0272	.0109	
			<i>c</i>	.2046	.1700	.1971	.0271	.0075	
	10,000	20,000	<i>a</i>	.1998	.1680	.1953	.0273	.0045	
			<i>b</i>	.1989	.1663	.1936	.0273	.0053	
			<i>c</i>	.2056	.1699	.1971	.0272	.0085	
	0	20,000	<i>a</i>	.1997	.1725	.1990	.0265	.0007	
			<i>b</i>	.2002	.1722	.1986	.0264	.0016	
			<i>c</i>	.2009	.1730	.1995	.0265	.0014	

Bar rested 35 days.

Bar heated in oil bath to 500° F. and kept at that temperature 1 hour; cooled slowly in oil bath; first annealing.

Bar annealed same manner as before at temperature of 500° F., second annealing.

1,000	21,000	a	.2016 .2018 .2016	.1709 .1706 .1716	.1979 .1973 .1985	.0270 .0267 .0269	.0037 .0045 .0031
1,000	22,000	a b c	.1986 .2026 .2019	.1705 .1702 .1717	.1974 .1970 .1984	.0269 .0268 .0267	.0012 .0056 .0035
1,000	23,000	a b c	.1976 .2000 .2027	.1704 .1695 .1713	.1973 .1964 .1983	.0269 .0269 .0270	.0003 .0036 .0044
0	23,000	a b c	.2000 .2000 .2001	.1735 .1737 .1737	.1998 .1989 .1999	.0263 .0262 .0262	.0002 .0001 .0002
1,000	24,000	a b c	.1996 .2012 .2008	.1726 .1724 .1726	.1990 .1986 .1992	.0264 .0262 .0266	.0006 .0026 .0016
1,000	25,000	a b c	.1988 .2015 .2012	.1719 .1717 .1726	.1984 .1981 .1990	.0265 .0264 .0264	.0004 .0034 .0022
1,000	26,000	a b c	.2018 .2012 .2007	.1719 .1715 .1720	.1985 .1979 .1986	.0266 .0264 .0266	.0033 .0033 .0031
1,000	27,000	a b c	.1996 .1999 .2019	.1714 .1710 .1721	.1982 .1975 .1988	.0268 .0265 .0267	.0014 .0024 .0031
1,000	28,000	a b c	.2012 .1995 .2021	.1715 .1717 .1722	.1984 .1972 .1988	.0269 .0255 .0266	.0028 .0023 .0033
5,000	33,000	a b c	.1983 .2026 .2019	.1706 .1705 .1716	.1974 .1972 .1984	.0268 .0267 .0268	.0009 .0054 .0035
10,000	43,000	a b c	.2011 .2029 .2019	.1703 .1702 .1713	.1973 .1970 .1981	.0270 .0268 .0268	.0038 .0059 .0038
0	43,000	a b c	.1997 .1998 .2000	.1733 .1734 .1736	.1995 .1995 .1998	.0262 .0261 .0262	.0002 .0003 .0002

No. 62.—*Wrought-iron bar (Burden's). Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 35,000	1,000	44,000	<i>a</i>	<i>Inch.</i> .2012	<i>Inch.</i> .1720	<i>Inch.</i> .1987	<i>Inch.</i> .0267	<i>Inch.</i> .0025	Bar annealed same manner as before at temperature of 500° F.; third annealing.
			<i>b</i>	.2010	.1716	.1980	.0264	.0030	
			<i>c</i>	.2008	.1723	.1988	.0285	.0020	
	1,000	45,000	<i>a</i>	.1992	.1713	.1982	.0269	.0010	
			<i>b</i>	.1988	.1706	.1974	.0268	.0024	
			<i>c</i>	.2015	.1718	.1985	.0267	.0030	
	1,000	46,000	<i>a</i>	.1993	.1712	.1979	.0267	.0014	
			<i>b</i>	.1996	.1703	.1970	.0267	.0026	
			<i>c</i>	.2018	.1716	.1983	.0267	.0035	
	1,000	47,000	<i>a</i>	.2012	.1711	.1980	.0269	.0032	
			<i>b</i>	.1995	.1702	.1968	.0266	.0027	
			<i>c</i>	.2019	.1715	.1983	.0268	.0036	
	1,000	48,000	<i>a</i>	.1976	.1701	.1972	.0271	.0004	
			<i>b</i>	.2019	.1704	.1970	.0266	.0049	
			<i>c</i>	.2016	.1715	.1982	.0267	.0034	
	5,000	53,000	<i>a</i>	.2019	.1707	.1978	.0271	.0041	
			<i>b</i>	.1993	.1693	.1962	.0269	.0031	
			<i>c</i>	.2022	.1714	.1981	.0267	.0041	
	10,000	63,000	<i>a</i>	.1974	.1700	.1969	.0269	.0005	
			<i>b</i>	.1999	.1694	.1963	.0260	.0036	
			<i>c</i>	.2026	.1713	.1981	.0268	.0045	
	0	63,000	<i>a</i>	.2017	.1754	.1915	.0261	.0002	
			<i>b</i>	.1976	.1713	.1973	.0260	.0003	
			<i>c</i>	.2005	.1739	.1902	.0263	.0003	
	1,000	64,000	<i>a</i>	.2019	.1726	.1993	.0267	.0026	
			<i>b</i>	.1983	.1699	.1966	.0267	.0022	
			<i>c</i>	.2015	.1723	.1989	.0266	.0026	
	1,000	65,000	<i>a</i>	.1984	.1711	.1980	.0269	.0004	
			<i>b</i>	.2010	.1701	.1963	.0267	.0042	
			<i>c</i>	.2015	.1718	.1986	.0268	.0029	

Bar annealed same manner as before at temperature of 500°  
F.; fourth annealing.

1, 000	66, 000	a b c	.2025 .1992 .2016	.1717 .1699 .1717	.1987 .1966 .1985	.0270 .0267 .0268	.0038 .0026 .0031
1, 000	67, 000	a b c	.2008 .2016 .2015	.1710 .1700 .1715	.1981 .1969 .1984	.0271 .0269 .0269	.0027 .0047 .0031
1, 000	68, 000	a b c	.2024 .2014 .2014	.1712 .1699 .1714	.1983 .1966 .1982	.0271 .0267 .0266	.0041 .0048 .0032
5, 000	73, 000	a b c	.1978 .1999 .2024	.1704 .1692 .1712	.1975 .1963 .1983	.0271 .0271 .0271	.0003 .0036 .0041
10, 000	83, 000	a b c	.2016 .1993 .2027	.1703 .1688 .1712	.1975 .1959 .1981	.0272 .0271 .0269	.0041 .0034 .0046
0	83, 000	a b c	.2000 .1996 .2004	.1734 .1733 .1735	.1988 .1984 .2000	.0264 .0261 .0264	.0002 .0002 .0004
1, 000	84, 000	a b c	.2020 .2003 .2010	.1721 .1710 .1722	.1989 .1978 .1988	.0268 .0268 .0266	.0031 .0025 .0022
1, 000	85, 000	a b c	.1986 .2017 .2015	.1711 .1706 .1720	.1981 .1974 .1988	.0271 .0268 .0268	.0005 .0043 .0027
1, 000	86, 000	a b c	.2016 .1995 .2019	.1715 .1704 .1720	.1984 .1969 .1987	.0269 .0265 .0267	.0032 .0026 .0032
1, 000	87, 000	a b c	.2003 .1991 .2022	.1711 .1700 .1718	.1980 .1968 .1986	.0269 .0268 .0268	.0023 .0023 .0036
1, 000	88, 000	a b c	.2020 .1994 .2023	.1713 .1696 .1718	.1984 .1965 .1985	.0271 .0269 .0267	.0036 .0029 .0038
5, 000	93, 000	a b c	.1973 .2008 .2024	.1699 .1698 .1711	.1970 .1967 .1983	.0271 .0269 .0272	.0003 .0041 .0041
10, 000	103, 000	a b c	.1971 .2025 .2022	.1695 .1699 .1710	.1986 .1967 .1982	.0271 .0268 .0272	.0005 .0038 .0040

No. 62.—Wrought-iron bar (*Burden's*). *Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i>			<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
35,000	●	103,000	<i>a</i>	.2003	.1738	.2001	.0263	.0002	Bar annealed same manner as before at temperature of 500° F.; fifth annealing.
			<i>b</i>	.1998	.1731	.1993	.0262	.0003	
			<i>c</i>	.2002	.1734	.1998	.0264	.0004	
1,000	●	104,000	<i>a</i>	.1986	.1714	.1985	.0271	.0001	
			<i>b</i>	.2001	.1708	.1974	.0266	.0027	
			<i>c</i>	.2015	.1721	.1988	.0267	.0027	
1,000	●	105,000	<i>a</i>	.1988	.1714	.1984	.0270	.0004	
			<i>b</i>	.1997	.1704	.1971	.0267	.0026	
			<i>c</i>	.2018	.1719	.1986	.0267	.0032	
1,000	●	106,000	<i>a</i>	.1984	.1708	.1978	.0270	.0006	
			<i>b</i>	.2021	.1705	.1973	.0268	.0048	
			<i>c</i>	.2015	.1715	.1985	.0270	.0030	
1,000	●	107,000	<i>a</i>	.2003	.1710	.1981	.0271	.0022	
			<i>b</i>	.1996	.1696	.1968	.0270	.0038	
			<i>c</i>	.2022	.1715	.1985	.0270	.0037	
1,000	●	108,000	<i>a</i>	.1987	.1706	.1977	.0271	.0010	
			<i>b</i>	.2022	.1703	.1971	.0268	.0051	
			<i>c</i>	.2017	.1713	.1984	.0271	.0033	
5,000	●	113,000	<i>a</i>	.2004	.1703	.1977	.0274	.0027	
			<i>b</i>	.1994	.1693	.1964	.0271	.0030	
			<i>c</i>	.2025	.1715	.1983	.0268	.0042	
10,000	●	123,000	<i>a</i>	.2034	.1704	.1780	.0276	.0054	Bar annealed same manner as before at temperature of 500° F.; sixth annealing.
			<i>b</i>	.2005	.1697	.1968	.0271	.0037	
			<i>c</i>	.2020	.1713	.1982	.0269	.0036	
0	●	123,000	<i>a</i>	.2004	.1735	.2001	.0206	.0003	
			<i>b</i>	.1999	.1729	.1994	.0265	.0005	
			<i>c</i>	.1998	.1730	.1995	.0265	.0003	



[illegible]

No. 63.—*Wrought-iron bar (Burden's). Mark, 4.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end-bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 35,000	0	0	<i>a</i>	<i>Inch.</i> .2000	<i>Inch.</i> .1734	<i>Inch.</i> .1997	<i>Inch.</i> .0263	<i>Inch.</i> .0003	
			<i>b</i>	.2005	.1749	.2002	.0263	.0004	
			<i>c</i>	.2002	.1736	.1998	.0262	.0004	
	1,000	1,000	<i>a</i>	.2053	.1689	.1960	.0271	.0093	
			<i>b</i>	.2009	.1676	.1947	.0271	.0062	
			<i>c</i>	.2039	.1704	.1973	.0269	.0066	
	1,000	2,000	<i>a</i>	.2049	.1669	.1941	.0272	.0108	
			<i>b</i>	.2055	.1673	.1948	.0270	.0108	
			<i>c</i>	.2040	.1698	.1966	.0270	.0074	
	1,000	3,000	<i>a</i>	.2014	.1668	.1941	.0273	.0073	
			<i>b</i>	.1999	.1659	.1937	.0272	.0068	
			<i>c</i>	.2063	.1698	.1967	.0269	.0096	
	1,000	4,000	<i>a</i>	.2045	.1669	.1941	.0272	.0104	
			<i>b</i>	.2059	.1678	.1949	.0271	.0110	
			<i>c</i>	.2039	.1693	.1964	.0271	.0075	
	1,000	5,000	<i>a</i>	.1946	.1661	.1936	.0275	.0010	
			<i>b</i>	.2013	.1672	.1943	.0271	.0070	
			<i>c</i>	.2060	.1698	.1968	.0270	.0092	
	5,000	10,000	<i>a</i>	.2029	.1671	.1945	.0274	.0084	
			<i>b</i>	.2060	.1685	.1957	.0272	.0103	
			<i>c</i>	.2032	.1693	.1965	.0272	.0067	
	10,000	20,000	<i>a</i>	.2005	.1676	.1949	.0273	.0056	
			<i>b</i>	.2055	.1692	.1964	.0272	.0091	
			<i>c</i>	.2031	.1697	.1968	.0271	.0063	
	10,000	30,000	<i>a</i>	.1954	.1675	.1949	.0274	.0005	
			<i>b</i>	.2003	.1686	.1958	.0272	.0045	
			<i>c</i>	.2050	.1705	.1976	.0271	.0074	



No. 63.—*Wrought-iron bar (Burden's). Mark 4—Continued.*

Maximum fiber stress per square inch	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 35,000	10,000	73,000	<i>a</i> <i>b</i> <i>c</i>	<i>Inch.</i> .2028 .2004 .2028	<i>Inch.</i> .1704 .1698 .1709	<i>Inch.</i> .1974 .1969 .1979	<i>Inch.</i> .0270 .0271 .0270	<i>Inch.</i> .0054 .0035 .0049	Bar annealed same manner as before at temperature of 500° F.; second annealing.
	10,000	83,000	<i>a</i> <i>b</i> <i>c</i>	.2021 .2003 .2033	.1700 .1696 .1708	.1972 .1966 .1980	.0273 .0270 .0272	.0049 .0037 .0053	
	0	83,000	<i>a</i> <i>b</i> <i>c</i>	.2004 .1997 .2001	.1741 .1733 .1739	.2003 .1995 .1998	.0282 .0282 .0259	.0001 .0002 .0003	
	1,000	84,000	<i>a</i> <i>b</i> <i>c</i>	.2007 .2013 .2008	.1723 .1720 .1723	.1989 .1985 .1988	.0266 .0255 .0255	.0018 .0028 .0020	
	1,000	85,000	<i>a</i> <i>b</i> <i>c</i>	.2023 .2003 .2012	.1719 .1714 .1718	.1987 .1980 .1986	.0268 .0266 .0268	.0036 .0023 .0026	
	1,000	86,000	<i>a</i> <i>b</i> <i>c</i>	.2000 .2019 .2013	.1716 .1713 .1716	.1979 .1981 .1984	.0253 .0268 .0268	.0021 .0038 .0029	
	1,000	87,000	<i>a</i> <i>b</i> <i>c</i>	.2017 .2002 .2018	.1715 .1709 .1713	.1982 .1976 .1983	.0267 .0267 .0270	.0035 .0026 .0035	
	1,000	88,000	<i>a</i> <i>b</i> <i>c</i>	.2014 .2002 .2020	.1710 .1707 .1714	.1979 .1974 .1982	.0269 .0267 .0268	.0035 .0028 .0038	
	5,000	93,000	<i>a</i> <i>b</i> <i>c</i>	.2038 .2018 .2015	.1706 .1707 .1709	.1977 .1976 .1979	.0271 .0269 .0270	.0061 .0042 .0036	
	10,000	103,000	<i>a</i> <i>b</i> <i>c</i>	.1964 .2024 .2026	.1689 .1703 .1709	.1981 .1972 .1979	.0272 .0269 .0270	.0003 .0052 .0047	

10, 000	113, 000	a	.1963	.1688	.1958	.0270	.0005
		b	.2028	.1704	.1972	.0268	.0056
		c	.2026	.1709	.1978	.0269	.0048
10, 000	123, 000	a	.1971	.1890	.1960	.0270	.0011
		b	.2040	.1704	.1973	.0269	.0067
		c	.2024	.1706	.1976	.0270	.0048
0	123, 000	a	.1997	.1733	.1995	.0262	.0002
		b	.1996	.1732	.1992	.0260	.0004
		c	.2011	.1745	.2008	.0263	.0003
1, 000	124, 000	a	.1993	.1715	.1981	.0266	.0012
		b	.2017	.1717	.1984	.0267	.0033
		c	.2016	.1725	.1982	.0267	.0024
1, 000	125, 000	a	.1988	.1707	.1976	.0269	.0012
		b	.2023	.1714	.1981	.0267	.0042
		c	.2015	.1719	.1987	.0268	.0028
1, 000	126, 000	a	.2009	.1709	.1976	.0267	.0033
		b	.2002	.1707	.1975	.0268	.0037
		c	.2023	.1718	.1986	.0268	.0037
1, 000	127, 000	a	.1983	.1702	.1972	.0270	.0011
		b	.2004	.1706	.1975	.0269	.0029
		c	.2025	.1715	.1985	.0270	.0040
1, 000	128, 000	a	.1988	.1700	.1970	.0270	.0013
		b	.2038	.1707	.1978	.0271	.0050
		c	.2019	.1713	.1983	.0270	.0036
5, 000	133, 000	a	.2028	.1705	.1975	.0270	.0053
		b	.2002	.1700	.1970	.0270	.0032
		c	.2023	.1712	.1982	.0270	.0041
10, 000	143, 000	a	.2042	.1700	.1975	.0275	.0067
		b	.2014	.1700	.1972	.0272	.0042
		c	.2020	.1708	.1979	.0271	.0041
10, 000	153, 000	a	.1960	.1682	.1955	.0273	.0005
		b	.2032	.1700	.1971	.0271	.0061
		c	.2028	.1705	.1977	.0272	.0051
10, 000	163, 000	a	.2002	.1695	.1966	.0271	.0036
		b	.1997	.1690	.1963	.0273	.0034
		c	.2035	.1707	.1977	.0270	.0058

Bar annealed same manner as before at temperature of 500°  
F.; third annealing.

Bar annealed same manner as before at temperature of 500°  
F., fourth annealing.

No. 63.—*Wrought-iron bar (Burden's). Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 135,000	0	163,000	<i>a</i>	<i>Inch.</i> .2004 .2001 .2002	<i>Inch.</i> .1739 .1734 .1736	<i>Inch.</i> .2003 .1997 .1999	<i>Inch.</i> .0264 .0263 .0263	<i>Inch.</i> .0001 .0004 .0003	
	1,000	164,000	<i>a</i>	.2004	.1717	.1986	.0269	.0018	
			<i>b</i>	.2005	.1714	.1981	.0267	.0034	
			<i>c</i>	.2015	.1719	.1986	.0267	.0029	
	1,000	165,000	<i>a</i>	.1984	.1710	.1981	.0271	.0003	
			<i>b</i>	.2006	.1709	.1979	.0270	.0027	
			<i>c</i>	.2017	.1715	.1984	.0269	.0033	
	1,000	166,000	<i>a</i>	.2030	.1711	.1984	.0273	.0046	
			<i>b</i>	.2016	.1709	.1980	.0271	.0036	
			<i>c</i>	.2015	.1713	.1982	.0269	.0033	
	1,000	167,000	<i>a</i>	.2034	.1710	.1983	.0273	.0051	
			<i>b</i>	.2016	.1708	.1979	.0271	.0037	
			<i>c</i>	.2015	.1713	.1983	.0270	.0032	
	1,000	168,000	<i>a</i>	.2014	.1710	.1980	.0270	.0034	
			<i>b</i>	.2022	.1708	.1978	.0270	.0044	
			<i>c</i>	.2014	.1715	.1989	.0267	.0025	
	5,000	173,000	<i>a</i>	.2037	.1709	.1980	.0271	.0057	
			<i>b</i>	.2008	.1700	.1972	.0272	.0036	
			<i>c</i>	.2020	.1710	.1981	.0271	.0039	
	10,000	183,000	<i>a</i>	.2028	.1697	.1973	.0276	.0035	
			<i>b</i>	.2025	.1689	.1971	.0282	.0054	
			<i>c</i>	.2020	.1703	.1979	.0276	.0041	
	10,000	193,000	<i>a</i>	.2039	.1694	.1972	.0278	.0067	
			<i>b</i>	.2021	.1664	.1958	.0294	.0063	
			<i>c</i>	.2023	.1705	.1982	.0277	.0041	
	8,300	201,300							Bar ruptured.

No. 64.—Wrought-iron bar (*Burden's*). *Mark, 4.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 35,000	0	0	<i>a</i>	<i>Inch.</i> .1998	<i>Inch.</i> .1730	<i>Inch.</i> .1994	<i>Inch.</i> .0264	<i>Inch.</i> .0004	
			<i>b</i>	.2006	.1738	.2000	.0262	.0006	
			<i>c</i>	.2002	.1732	.1996	.0264	.0006	
1,000	1,000	1,000	<i>a</i>	.1935	.1644	.1915	.0271	.0020	
			<i>b</i>	.2020	.1675	.1945	.0270	.0075	
			<i>c</i>	.2068	.1684	.1954	.0270	.0112	
2,000	2,000	2,000	<i>a</i>	.1912	.1624	.1896	.0272	.0016	
			<i>b</i>	.2000	.1679	.1850	.0271	.0110	
			<i>c</i>	.2065	.1685	.1955	.0270	.0110	
3,000	3,000	3,000	<i>a</i>	.1859	.1649	.1820	.0271	.0039	
			<i>b</i>	.2085	.1688	.1859	.0271	.0126	
			<i>c</i>	.2044	.1686	.1954	.0269	.0090	
4,000	4,000	4,000	<i>a</i>	.2067	.1671	.1941	.0270	.0126	
			<i>b</i>	.2055	.1688	.1959	.0271	.0096	
			<i>c</i>	.2037	.1685	.1954	.0269	.0083	
5,000	5,000	5,000	<i>a</i>	.2005	.1656	.1930	.0274	.0075	
			<i>b</i>	.2004	.1674	.1944	.0270	.0060	
			<i>c</i>	.2068	.1689	.1960	.0271	.0108	
10,000	10,000	10,000							Bar rested 15 hours.
			<i>a</i>	.1974	.1697	.1963	.0266	.0011	
			<i>b, c</i>	.2067	.1743	.2008	.0263	.0061	
10,000	10,000	20,000							After 15 hours' rest.
			<i>a</i>	.1999	.1700	.1968	.0266	.0033	
			<i>b</i>	.2014	.1692	.1954	.0272	.0060	
10,000	10,000	20,000	<i>b</i>	.2002	.1686	.1957	.0271	.0045	
			<i>c</i>	.2046	.1700	.1970	.0270	.0076	

No. 64.—Wrought-iron bar (*Burden's*). *Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded. <i>Inch.</i>	Loaded. <i>Inch.</i>	Unloaded. <i>Inch.</i>			
<i>Pounds.</i> 35,000	10,000	30,000	<i>a</i> <i>b</i> <i>c</i>	.2021 .2000 .2040	.1688 .1685 .1701	.1955 .1958 .1972	.0273 .0273 .0271	.0062 .0042 .0068	Bar rested 23 days.
	10,000	40,000	<i>a</i> <i>b</i> <i>c</i>	.2048 .2026 .2024	.1692 .1689 .1701	.1965 .1972 .1972	.0273 .0273 .0271	.0083 .0054 .0052	
	0	40,000	<i>a</i> <i>b</i> <i>c</i>	.2025 .2012 .1990	.1745 .1728 .1710	.2009 .1994 .1975	.0264 .0266 .0265	.0016 .0018 .0015	
	1,000	41,000	<i>a</i> <i>b</i> <i>c</i>	.2011 .2023 .2009	.1716 .1717 .1710	.1986 .1986 .1979	.0270 .0269 .0269	.0025 .0037 .0030	
	1,000	42,000	<i>a</i> <i>b</i> <i>c</i>	.2013 .2024 .2010	.1717 .1716 .1710	.1985 .1985 .1979	.0268 .0269 .0269	.0028 .0039 .0031	
	1,000	43,000	<i>a</i> <i>b</i> <i>c</i>	.2022 .2025 .2010	.1714 .1713 .1709	.1984 .1983 .1978	.0270 .0270 .0269	.0038 .0042 .0032	
	0	43,000	<i>a</i> <i>b</i> <i>c</i>	.1998 .2010 .2001	.1736 .1746 .1735	.1996 .2006 .1998	.0260 .0260 .0263	.0002 .0004 .0005	
	1,000	44,000	<i>a</i> <i>b</i> <i>c</i>	.2018 .2014 .2008	.1726 .1737 .1724	.1990 .1994 .1989	.0264 .0267 .0265	.0028 .0020 .0019	
	1,000	45,000	<i>a</i> <i>b</i> <i>c</i>	.2023 .2011 .2009	.1734 .1724 .1722	.1989 .1989 .1986	.0265 .0265 .0264	.0034 .0022 .0023	
	1,000	46,000	<i>a</i> <i>b</i> <i>c</i>	.2007 .2007 .2015	.1716 .1719 .1719	.1984 .1986 .1985	.0268 .0267 .0266	.0023 .0021 .0030	

Bar heated in oil bath to 500° F. and kept at that temperature 1 hour; cooled slowly in oil bath; first annealing.



Bar annealed same manner as before at temperature of 500° F.;  
second annealing.

1,000	47,000	a	.2008 .2007 .2016	.1717 .1716 .1716	.1884 .1884 .1884	.0267 .0268 .0268	.0024 .0023 .0032
1,000	48,000	a b c	.1985 .2030 .2013	.1713 .1719 .1719	.1978 .1986 .1985	.0265 .0267 .0266	.0007 .0044 .0028
5,000	53,000	a b c	.1978 .2017 .2018	.1708 .1714 .1716	.1975 .1983 .1983	.0267 .0269 .0267	.0003 .0034 .0035
10,000	63,000	a b c	.1985 .2037 .2016	.1704 .1714 .1714	.1973 .1983 .1980	.0269 .0269 .0266	.0012 .0054 .0036
10,000	73,000	a b c	.2022 .2006 .2021	.1711 .1705 .1713	.1978 .1977 .1980	.0267 .0272 .0267	.0044 .0029 .0041
10,000	83,000	a b c	.2021 .2008 .2024	.1706 .1706 .1712	.1975 .1974 .1979	.0269 .0268 .0267	.0045 .0034 .0045
0	83,000	a b c	.1995 .2002 .2002	.1730 .1737 .1736	.1993 .1999 .1999	.0263 .0262 .0263	.0002 .0003 .0003
1,000	84,000	a b c	.2016 .2006 .2010	.1718 .1719 .1722	.1984 .1985 .1987	.0266 .0266 .0265	.0032 .0021 .0023
1,000	85,000	a b c	.2011 .2022 .2011	.1711 .1715 .1716	.1978 .1984 .1984	.0267 .0269 .0268	.0033 .0038 .0027
1,000	86,000	a b c	.2023 .2006 .2013	.1713 .1711 .1716	.1980 .1980 .1983	.0267 .0269 .0268	.0043 .0026 .0030
1,000	87,000	a b c	.1971 .2016 .2018	.1700 .1710 .1714	.1969 .1979 .1982	.0269 .0269 .0268	.0002 .0037 .0036
1,000	88,000	a b c	.2019 .2023 .2012	.1707 .1711 .1714	.1975 .1980 .1980	.0268 .0269 .0266	.0044 .0043 .0032
5,000	93,000	a b c	.2032 .2016 .2013	.1706 .1707 .1710	.1976 .1978 .1978	.0270 .0271 .0268	.0056 .0038 .0035

No. 64.—Wrought-iron bar (*Burden's*). *Mark, 4—Continued.*

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded. <i>Inch.</i>	Loaded. <i>Inch.</i>	Unloaded. <i>Inch.</i>			
<i>Pounds.</i> 35,000	10,000	103,000	<i>a</i>	.1978	.1700	.1969	.0269	<i>Inch.</i> .0009	Bar annealed same manner as before at temperature of 500° F.; third annealing.
			<i>b</i>	.2006	.1705	.1975	.0270	.0031	
			<i>c</i>	.2023	.1711	.1979	.0268	.0044	
10,000		113,000	<i>a</i>	.2003	.1700	.1969	.0269	.0034	
			<i>b</i>	.2005	.1704	.1971	.0257	.0034	
			<i>c</i>	.2024	.1709	.1978	.0269	.0046	
10,000		123,000	<i>a</i>	.2037	.1707	.1976	.0269	.0061	
			<i>b</i>	.2011	.1704	.1975	.0271	.0036	
			<i>c</i>	.2016	.1709	.1978	.0269	.0038	
0		123,000	<i>a</i>	.2001	.1737	.1999	.0262	.0002	
			<i>b</i>	.1985	.1716	.1981	.0265	.0004	
			<i>c</i>	.2016	.1747	.2011	.0264	.0005	
1,000		124,000	<i>a</i>	.1980	.1709	.1978	.0269	.0002	
			<i>b</i>	.2001	.1709	.1977	.0268	.0024	
			<i>c</i>	.2021	.1726	.1991	.0265	.0030	
1,000		125,000	<i>a</i>	.2021	.1715	.1981	.0266	.0040	
			<i>b</i>	.2016	.1709	.1977	.0268	.0038	
			<i>c</i>	.2015	.1721	.1987	.0266	.0028	
1,000		126,000	<i>a</i>	.1975	.1702	.1971	.0269	.0064	
			<i>b</i>	.2018	.1708	.1976	.0268	.0042	
			<i>c</i>	.2020	.1718	.1986	.0268	.0034	
1,000		127,000	<i>a</i>	.1985	.1708	.1975	.0267	.0010	
			<i>b</i>	.2002	.1706	.1974	.0268	.0028	
			<i>c</i>	.2022	.1719	.1985	.0266	.0037	
1,000		128,000	<i>a</i>	.2029	.1711	.1980	.0269	.0049	
			<i>b</i>	.2011	.1707	.1976	.0269	.0035	
			<i>c</i>	.2015	.1717	.1983	.0266	.0032	
5,000		133,000	<i>a</i>	.2030	.1708	.1977	.0269	.0053	
			<i>b</i>	.2008	.1705	.1975	.0270	.0033	
			<i>c</i>	.2016	.1714	.1981	.0267	.0035	

Bar annealed same manner as before at temperature of 500° F.;  
fourth annealing.

10, 000	143, 000	a b c	.1993 .2002 .2026	.1699 .1700 .1711	.1970 .1980	.0271 .0270 .0269	.0023 .0032 .0045
10, 000	153, 000	a b c	.2028 .2005 .2017	.1707 .1699 .1710	.1978 .1979	.0271 .0272 .0269	.0050 .0034 .0038
10, 000	163, 000	a b c	.1983 .2034 .2016	.1698 .1703 .1710	.1969 .1976 .1978	.0271 .0273 .0268	.0014 .0053 .0038
0	163, 000	a b c	.1998 .2004 .2002	.1733 .1734 .1734	.1996 .1999 .1998	.0263 .0265 .0264	.0002 .0005 .0004
1, 000	164, 000	a b c	.1984 .2020 .2012	.1710 .1712 .1720	.1979 .1985 .1986	.0269 .0273 .0266	.0005 .0035 .0026
1, 000	165, 000	a b c	.1979 .2021 .2015	.1706 .1707 .1716	.1975 .1982 .1985	.0269 .0275 .0269	.0004 .0039 .0030
1, 000	166, 000	a b c	.2002 .2023 .2012	.1709 .1709 .1715	.1977 .1982 .1984	.0268 .0273 .0269	.0025 .0041 .0038
1, 000	167, 000	a b c	.1984 .2005 .2020	.1706 .1705 .1715	.1977 .1978 .1984	.0271 .0273 .0269	.0007 .0027 .0036
1, 000	168, 000	a b c	.1986 .2028 .2014	.1706 .1706 .1714	.1975 .1980 .1983	.0269 .0274 .0269	.0011 .0046 .0031
5, 000	173, 000	a b c	.2007 .2001 .2022	.1704 .1698 .1713	.1977 .1978 .1983	.0273 .0277 .0270	.0030 .0028 .0039
10, 000	183, 000	a b c	.2024 .2024 .2015	.1705 .1678 .1707	.1981 .1964 .1978	.0276 .0286 .0271	.0043 .0060 .0037
8, 600	191, 600						

Bar ruptured.

No. 65.—*Wrought-iron bar (Burden's). Mark, 5.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. <i>Inch.</i>	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 30,000	0	0	<i>a</i> <i>b</i> <i>c</i>	<i>Inch.</i> .1999 .2001 .2002	<i>Inch.</i> .1773 .1774 .1775	<i>Inch.</i> .1997 .1998 .1999	<i>Inch.</i> .0224 .0224 .0224	<i>Inch.</i> .0002 .0003 .0003	
	1,000	1,000	<i>a</i> <i>b</i> <i>c</i>	.1998 .2004 .2005	.1771 .1771 .1768	.1995 .1996 .1998	.0224 .0225 .0225	.0003 .0008 .0012	
	1,000	2,000	<i>a</i> <i>b</i> <i>c</i>	.2004 .2001 .2006	.1770 .1771 .1764	.1995 .1995 .1990	.0225 .0224 .0226	.0009 .0008 .0016	
	1,000	3,000	<i>a</i> <i>b</i> <i>c</i>	.1992 .1997 .2013	.1766 .1768 .1764	.1990 .1992 .1989	.0224 .0224 .0225	.0002 .0005 .0024	
	2,000	5,000	<i>a</i> <i>b</i> <i>c</i>	.2003 .1999 .2009	.1768 .1768 .1760	.1993 .1768 .1987	.0225 .0226 .0227	.0010 .0008 .0022	
	662,500	667,500							Bar ruptured.

No. 66.—*Wrought-iron bar (Burden's). Mark, 5.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 30,000	0	0	a	<i>Inch.</i> .2004 .2007 .2005	<i>Inch.</i> .1783 .1781 .1779	<i>Inch.</i> .2002 .2004 .2001	<i>Inch.</i> .0219 .0223 .0222	<i>Inch.</i> .0002 .0003 .0004	
	1,000	1,000	a b c	.2001 .2008 .2007	.1777 .1774 .1778	.1999 .1998 .2001	.0222 .0221 .0223	.0002 .0010 .0008	
	1,000	2,000	a b c	.1997 .2016 .2008	.1771 .1770 .1776	.1995 .1996 .2001	.0224 .0226 .0225	.0002 .0020 .0007	
	1,000	3,000	a b c	.2010 .2007 .2010	.1773 .1768 .1776	.1998 .1994 .2000	.0225 .0228 .0224	.0012 .0013 .0010	
	2,000	5,000	a b c	.2014 .2010 .2010	.1774 .1764 .1776	.1998 .1993 .2002	.0224 .0229 .0226	.0016 .0017 .0008	
	895,900	900,900							Bar ruptured.

No. 67.—*Wrought-iron bar (Burdett's). Mark, 5.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.  Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds, 30,000	0	0	a	Inch. .2000	Inch. .1775	Inch. .1998	Inch. .0223	Inch. .0002	
			b	.2003	.1777	.2001	.0224	.0002	
			c	.2001	.1776	.1998	.0222	.0003	
	1,000	1,000	a	.2001	.1772	.1996	.0224	.0005	
			b	.2005	.1779	.2000	.0221	.0005	
			c	.2002	.1771	.1995	.0224	.0007	
	1,000	2,000	a	.2006	.1768	.1993	.0225	.0013	
			b	.2004	.1777	.2000	.0223	.0004	
			c	.2001	.1768	.1992	.0224	.0009	
	1,000	3,000	a	.2006	.1770	.1992	.0223	.0014	
			b	.2004	.1777	.2000	.0223	.0004	
			c	.2005	.1768	.1992	.0224	.0013	
	2,000	5,000	a	.2006	.1765	.1991	.0226	.0015	
			b	.2005	.1776	.2000	.0224	.0005	
			c	.2005	.1766	.1990	.0224	.0015	
	5,000	10,000	a	.2000	.1762	.1988	.0226	.0012	
			b	.2007	.1775	.1999	.0224	.0008	
			c	.2007	.1763	.1989	.0226	.0018	
	90,000	100,000	a	.2014	.1759	.1984	.0225	.0030	
			b	.2005	.1769	.1993	.0224	.0012	
			c	.2010	.1761	.1985	.0224	.0025	
	96,000	196,000	a	.2022	.1753	.1983	.0230	.0039	
			b	.2011	.1766	.1992	.0226	.0019	
			c	.2011	.1756	.1985	.0229	.0026	
	100,000	296,000	a	.2024	.1751	.1981	.0230	.0043	
			b	.2010	.1765	.1991	.0226	.0019	
			c	.2012	.1757	.1985	.0228	.0027	
	104,000	400,000	a	.2018	.1748	.1979	.0231	.0039	
			b	.2005	.1761	.1989	.0228	.0016	
			c	.2014	.1755	.1984	.0229	.0030	

Bar rested 21 days.

Bar heated in oil bath to 500° F. and kept at that temperature 1 hour. Cooled slowly in oil bath.

0	400,000	a b c	.2015 .2005 .1995	.1778 .1778 .1763	.2003 .2001 .1986	.0225 .0223 .0223	.0012 .0004 .0009
1,000	401,000	a b c	.1998 .2007 .2005	.1768 .1774 .1765	.1993 .1997 .1989	.0225 .0223 .0224	.0005 .0010 .0016
1,000	402,000	a b c	.2009 .2008 .2004	.1766 .1772 .1763	.1994 .1997 .1988	.0228 .0225 .0225	.0015 .0011 .0016
1,000	403,000	a b c	.1994 .2008 .2008	.1762 .1771 .1761	.1990 .1997 .1989	.0228 .0226 .0228	.0004 .0011 .0019
0	403,000	a b c	.2005 .2006 .1995	.1781 .1783 .1771	.2004 .2004 .1992	.0223 .0221 .0221	.0001 .0002 .0003
1,000	404,000	a b c	.2006 .2006 .1996	.1779 .1781 .1769	.2003 .2004 .1993	.0224 .0223 .0224	.0003 .0002 .0003
1,000	405,000	a b c	.2003 .2006 .1996	.1778 .1783 .1767	.2001 .2003 .1992	.0223 .0220 .0225	.0002 .0003 .0004
1,000	406,000	a b c	.2008 .2006 .1997	.1776 .1779 .1769	.2001 .2004 .1993	.0225 .0225 .0224	.0007 .0002 .0004
1,000	407,000	a b c	.2008 .2007 .1998	.1776 .1779 .1769	.2000 .2003 .1993	.0224 .0224 .0224	.0008 .0004 .0005
1,000	408,000	a b c	.2001 .2007 .1998	.1774 .1779 .1767	.1999 .2003 .1993	.0225 .0224 .0226	.0002 .0004 .0905
5,000	413,000	a b c	.1997 .2006 .2000	.1771 .1778 .1766	.1997 .2001 .1991	.0226 .0223 .0225	.0 .0005 .0009
94,900	507,900	a b c	.2000 .2027 .2008	.1745 .1775 .1753	.1979 .2001 .1982	.0334 .0226 .0239	.0021 .0026 .0026
28,300	536,200						

Bar heated in oil bath to 500° F. and kept at that temperature 1 hour. Cooled slowly in oil bath.

Bar ruptured.

No. 68.—*Wrought-iron bar (Burden's). Mark, 5.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections. Inch.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 30,000	0	0	a	Inch. .1999 .2003 .2005	Inch. .1775 .1778 .1779	Inch. .1997 .2022 .2002	Inch. .0222 .0222 .0223	Inch. .0002 .0003 .0003	
	1,000	1,000	a	.2004	.1768	.1993	.0225	.0011	
			b	.2005	.1776	.2000	.0224	.0005	
			c	.2007	.1775	.1999	.0224	.0008	
	1,000	2,000	a	.1995	.1765	.1989	.0224	.0006	
			b	.2004	.1775	.1999	.0224	.0005	
			c	.2009	.1774	.1998	.0224	.0011	
	1,000	3,000	a	.2005	.1767	.1990	.0223	.0015	
			b	.2004	.1776	.1999	.0223	.0005	
			c	.2008	.1775	.1998	.0223	.0010	
	2,000	5,000	a	.2011	.1765	.1989	.0224	.0022	
			b	.2006	.1776	.1999	.0223	.0007	
	5,000	10,000	a	.2008	.1773	.1997	.0224	.0011	
			b	.2001	.1762	.1986	.0224	.0015	
			c	.2009	.1775	.1998	.0223	.0010	
			c	.2009	.1771	.1996	.0225	.0013	
	96,000	100,000	a	.1999	.1765	.1990	.0225	.0019	
			b	.2004	.1767	.1991	.0224	.0013	
			c	.2015	.1768	.1982	.0214	.0033	
	96,000	196,000	a	.2016	.1759	.1985	.0226	.0031	
			b	.2011	.1763	.1993	.0225	.0018	
			c	.2011	.1768	.1993	.0225	.0018	
	100,000	296,000	a	.1983	.1752	.1978	.0226	.0005	
			b	.2013	.1763	.1901	.0225	.0022	
			c	.2014	.1767	.1993	.0226	.0021	



104, 000	400, 000	a	1991 .1991 .2016 .2011	.1752 .1763 .1765	.1982 .1983 .1991	.0230 .0225 .0226	.0009 .0023 .0020
0	400, 000	a b c	.2011 .2006 .1999	.1777 .1776 .1770	.2001 .2000 .1993	.0224 .0224 .0223	.0010 .0006 .0006
1, 000	401, 000	a	.1984 .2010 .2007	.1765 .1778 .1771	.1982 .1989 .1986	.0227 .0223 .0225	.0002 .0011 .0011
1, 000	402, 000	a b	.2009 .2009 .2007	.1764 .1775 .1769	.1983 .1989 .1985	.0229 .0224 .0226	.0016 .0010 .0012
1, 000	403, 000	a b c	.2008 .2006 .2009	.1764 .1773 .1771	.1982 .1988 .1985	.0228 .0225 .0224	.0016 .0008 .0014
0	403, 000	a	.1999 .2005 .2004	.1778 .1783 .1779	.1998 .2003 .2003	.0220 .0220 .0224	.0001 .0002 .0001
1, 000	404, 000	a b c	.2001 .2005 .2005	.1771 .1782 .1781	.1998 .2003 .2002	.0227 .0221 .0221	.0003 .0002 .0003
1, 000	405, 000	a b c	.1989 .2005 .2005	.1770 .1781 .1779	.1997 .2002 .2002	.0227 .0221 .0223	.0002 .0003 .0003
1, 000	406, 000	a b c	.1989 .2006 .2005	.1770 .1780 .1778	.1997 .2002 .2002	.0227 .0222 .0224	.0002 .0004 .0003
1, 000	407, 000	a b c	.2002 .2006 .2006	.1789 .1780 .1778	.1997 .2002 .2001	.0228 .0222 .0223	.0005 .0004 .0005
1, 000	408, 000	a b c	.1986 .2005 .2006	.1768 .1778 .1777	.1995 .2002 .2001	.0227 .0224 .0224	.0001 .0003 .0005
5, 000	413, 000	a b c	.2006 .2006 .2007	.1765 .1776 .1775	.1995 .2000 .2000	.0230 .0224 .0225	.0011 .0006 .0007
49, 400	462, 400						

Rested 17 days.

Bar heated in oil bath to 500° F., and kept at that temperature 1 hour. Cooled slowly in oil bath.

Bar ruptured.

**TEST No. 69.—***Wrought-iron shaft from rod No. 5.*

Diameter, 1." ; speed of rotation, 2,200 per minute ; length between end bearings, 33".

Tested under 30,000 pounds per square inch maximum fiber stress.

A stream of cold water played on shaft during the test.

Rupture occurred at 556,400 rotations.





TEST NO. 80.— *Wrought-iron shaft from rod No. 6.*

The shaft was initially heated and maintained at about 200° F. during the test by means of a gas burner, the heat of the shaft itself not being sufficient to maintain the above temperature while running.

The shaft made 56,600 rotations the first day of the test, it then cooled, but was reheated the following morning before resuming the test.

Rupture occurred at 129,600 rotations.

No. 80.—*Wrought-iron bar (Burden's). Mark, 6.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	a b c	<i>Inch.</i> .2014 .2014 .2014	<i>Inch.</i> .1710 .1709 .1707	<i>Inch.</i> .2010 .2010 .2009	<i>Inch.</i> .0300 .0301 .0302	<i>Inch.</i> .0004 .0004 .0005	Bar heated to about 200° F. by means of gas burners, and this temperature maintained during the test.
	0	0	a b c	.2005 .2008 .2009	.1872 .1688 .1693	.2000 .2005 .2005	.0328 .0317 .0312	.0005 .0003 .0004	
	1,000	1,000	a b c	.2000 .1979 .2053	.1681 .1660 .1712	.1396 .1372 .2022	.0315 .0312 .0310	.0004 .0007 .0031	
	1,000	2,000	a b c	.2039 .2020 .2004	.1695 .1693 .1678	.2014 .2006 .1989	.0319 .0313 .0311	.0025 .0014 .0015	
	1,000	3,000	a b c	.2019 .1984 .2039	.1690 .1665 .1701	.2006 .1976 .2011	.0316 .0311 .0310	.0013 .0008 .0028	
	128,600	128,600							Bar ruptured.

**TEST NO. 81.—*Wrought-iron shaft from rod No. 6.***

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33".

Tested under 40,000 pounds per square inch maximum fiber stress.

The shaft was initially heated, and temperature maintained at about 210° F. by means of a gas burner. The shaft made 42,600 rotations at the close of the first day.

It was reheated the following morning and the test resumed, and had completed 129,300 rotations at noon of the second day, when it cooled and rested without load one hour. It was again reheated and the test resumed.

Rupture occurred at 176,100 rotations.

The shaft was badly scored at the middle bearing during the test.





**TEST No. 91.—Wrought-iron shaft from rod No. 6a.**

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33".

The shaft was initially heated to the estimated temperature of 450° F. and then loaded with 40,000 pounds per square inch maximum fiber stress.

The shaft gradually deflected and would not sustain the load.

The shaft was cooled, rested 16 hours, and again heated to the above temperature, and straightened at this heat.

After straightening the temperature was increased to about 700° F., then loaded with 30,000 pounds per square inch maximum fiber stress, and rotations began.

When 54,000 rotations had been made the test was interrupted for about 1 minute; upon resuming the test there was violent wobbling, whereas before the interruption the shaft had run smoothly with constant deflection.

The vibrations which had set in continued for about 800 rotations, when their amplitude was partially checked by restricting the downward movements of the weighted lever, whereupon the tendency to wobble immediately ceased, and with the lever released the shaft run smoothly until ruptured, which occurred at 209,000 rotations.

**TEST No. 93.—Wrought-iron shaft from rod No. 6a.**

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33".

Maximum fiber stress, 35,000 pounds per square inch.

Initially heated. Approximate temperature of test, 500° F. for 30,000 rotations, then the shaft was cooled with water and the test completed cold.

The shaft run smoothly without wobbling motion throughout the test.

Ruptured at 187,800 rotations, the position of rupture being ".75 from the middle bearing.

**TEST No. 94.—Wrought-iron shaft from rod No. 6a.**

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33".

Maximum fiber stress, 35,000 pounds per square inch.

Initially heated. Approximate temperature of test, 550 F.

Shaft ruptured at 23,800 rotations.

**TEST No. 95.—***Wrought-iron shaft from rod No. 6a.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33".

Maximum fiber stress, 35,000 pounds per square inch.

Initially heated. Approximate temperature, 500° F. for 29,100 rotations; then the shaft was cooled with water and the test completed cold.

Ruptured at 158,400 rotations.

**TEST No. 92.—***Wrought-iron shaft from rod No. 7.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33".

Maximum fiber stress, 35,000 pounds per square inch.

When 42,000 rotations had been made there occurred violent wobbling of the shaft, which was arrested by momentarily checking the vibrations of the weighted lever, after which the shaft run smoothly for the remainder of the test.

Ruptured at 60,700 rotations.

**TEST No. 107.—***Wrought-iron shaft from rod No. 7.*

Diameter, 1". Speed of rotation 2,200 per minute. Length between end bearings, 33".

Maximum fibre stress, 40,000 pounds per square inch.

Initially heated to about 600° F. by means of gas burner.

When rotations began the gas was shut off, but owing to the high speed of rotation and the maximum fiber stress the temperature of the shaft remained at about the initial temperature.

At 106,000 rotations the shaft rested one hour without load, and was allowed to cool in the meantime.

The shaft was reheated to the initial temperature after resting and the test completed.

Ruptured at 107,000 rotations.

**TEST No. 100.—***Wrought-iron shaft from rod No. 8.*

Diameter, 1". Speed of rotation, 2,200 per minute. Length between end bearings, 33".

Maximum fiber stress, 40,000 pounds per square inch.

A stream of water played on shaft during the test.

Ruptured at 39,200 rotations.

TEST No. 101.—*Wrought iron shaft from rod No. 8.*

Diameter, 1". Speed of rotation, 2,200 per minute. Length between end bearings, 33".

Maximum fiber stress, 40,000 pounds per square inch.

Maximum temperature of the test, about 450 F., which was acquired during running. The test began cold.

Ruptured at 66,200 rotations.

TEST No. 102.—*Wrought-iron shaft from rod No. 8.*

Diameter, 1". Speed of rotation, 2,200 per minute. Length between end bearings, 33".

Maximum fiber stress, 40,000 pounds per square inch.

Maximum temperature of the test, about 550 F., which was acquired during running. The test began cold.

Ruptured at 138,200 rotations.

TEST No. 108.—*Wrought-iron shaft from rod No. 8.*

Diameter, 1". Speed of rotation, 2,200 per minute. Length between end bearings, 33".

Maximum fiber stress, 45,000 pounds per square inch.

Initially heated and tested at 600° F.

Shaft ruptured at 56,800 rotations.

TEST No. 109.—*Wrought-iron shaft from rod No. 8.*

Diameter, 1". Speed of rotation, 2,200 per minute. Length between end bearings, 33".

Maximum fiber stress, 45,000 pounds per square inch.

A stream of cold water was played on the shaft during the test.

Shaft ruptured at 16,500 rotations.

NO. 96.—*Wrought-iron bar No. 9.*

Diameter, 1". Speed of rotation, 22,000 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
				Inch.	Inch.	Inch.	Inch.	Inch.	
Pounds.									
10,000	25, 200	25, 200							
15,000	0	25, 200	a	.2000	.1892	.2000	.0108	0.	
			b	.1999	.1889	.1999	.0109	.0001	
			c	.1998	.1888	.1997	.0110	.0001	
	19, 950	45, 150	a	.2002	.1891	.2001	.0110	.0001	
			b	.1999	.1888	.1997	.0109	.0002	
			c	.1998	.1887	.1997	.0110	.0001	
20,000	0	45, 150	a	.2002	.1851	.2001	.0150	.0001	
			b	.1999	.1849	.1998	.0149	.0001	
			c	.1998	.1849	.1997	.0148	.0001	
	20, 050	65, 200	a	.2001	.1851	.2001	.0150	0.	
			b	.1999	.1849	.1999	.0150	0.	
			c	.1998	.1849	.1997	.0148	.0001	
25,000	0	65, 200	a	.2003	.1816	.2001	.0185	.0002	
			b	.1999	.1811	.1998	.0187	.0001	
			c	.1999	.1809	.1997	.0188	.0002	
	19, 900	85, 100	a	.2004	.1814	.2002	.0188	.0002	
			b	.1999	.1812	.1997	.0185	.0002	
			c	.1999	.1810	.1997	.0187	.0002	
30,000	0	85, 100	a	.2002	.1776	.1999	.0223	.0003	
			b	.2001	.1773	.1999	.0226	.0002	
			c	.2000	.1772	.1996	.0224	.0004	
	20, 000	105, 100	a	.1987	.1760	.1986	.0226	.0001	
			b	.2005	.1771	.1995	.0224	.0010	
			c	.2006	.1767	.1992	.0225	.0014	
	20, 000	125, 100	a	.1991	.1764	.1989	.0225	.0002	
			b	.2010	.1771	.1996	.0235	.0014	
			c	.2003	.1768	.1991	.0223	.0012	

35,000	19,900	145,000	a b c	1985 .2009 .2006	.1759 .1769 .1765	1983 .1984 .1991	.0224 .0225 .0226	Slight increase in temperature.
0	145,000	a b c	.2009 .2012 .2007	.1719 .1732 .1725	1982 .1992 .1988	.0263 .0260 .0263	.0027 .0020 .0019	
20,000	165,000	a b c	.1930 .2080 .2019	.1663 .1759 .1733	1931 .2031 .1998	.0288 .0282 .0265	.0001 — .0021	Temperature of bar about 200° F.
20,000	185,000	a b c	.2044 .2001 .1982	.1738 .1721 .1710	2005 .1988 .1977	.0287 .0013 .0267	.0039 .0015	Temperature about 200° F.
20,000	205,000	a b c	.2014 .1956 .2043	.1730 .1680 .1749	1998 .1946 .2013	.0268 .0265 .0264	.0016 .0010 .0030	Temperature about 200° F.
20,100	225,100	a b c	.2032 .2009 .1989	.1734 .1721 .1707	2007 .1990 .1974	.0273 .0269 .0267	.0025 .0019 .0015	Temperature about 200° F.
19,900	245,000	a b c	.1965 .1974 .2063	.1694 .1694 .1750	1962 .1964 .2012	.0268 .0270 .0262	.0003 .0010 .0051	Temperature about 200° F.
13,000	258,000							Bar ruptured. Temperature at the time about 200° F.

No. 97.—*Wrought-iron bar No. 9.*

Diameter, 1". Speed of rotation, 2,200 per minute. Length between end bearings, 33". Deflections measured on chord of 10". Estimated maximum temperature acquired during the test, 550° F.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
<i>Pounds.</i> 40,000	0	0	<i>a</i>	<i>Inch.</i> .2003 .2005 .1998	<i>Inch.</i> .1704 .1701 .1698	<i>Inch.</i> .2000 .2000 .1994	<i>Inch.</i> .0298 .0299 .0296	<i>Inch.</i> .0003 .0003 .0004	Temperature of bar increased rapidly.
	10,000	10,000	<i>a</i>	.2002	.1672	.1976	.0304	.0026	
	24,250	34,250	<i>b</i> <i>c</i>	.1996 .2034	.1676 .1702	.1978 .2001	.0302 .0299	.0018 .0033	
126,750		161,000							Pin in driving-head broke; the test then discontinued. The bar reached a temperature sufficient to color it dark straw brownish tint, and directly under the bronze ring (at the middle) the bar was colored blue, a bright light-colored tint. Bar ruptured.



No. 30.—*Cast Gun Iron. Mark 4.*

Diameter, 1". Speed of rotation, 400 per minute. Length between end bearings, 33". Deflections measured on chord of 10".

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.		Loaded.			
				Inch.	Inch.	Inch.			
<b>Pounds.</b> 18,000	.....	10,746,000		.....	.....	.....	Inch. .0191	Inch. .0008	Total run as per report of tests, 1889.
	2,039,500	12,785,500	a	.1986	.1796	.1985	.0189	.0001	
			b	.1991	.1794	.1985	.0191	.0006	
			c	.1987	.1790	.1979	.0189	.0008	
	1,924,600	14,710,100	a	.1987	.1798	.1986	.0188	.0001	
			b	.1994	.1799	.1988	.0189	.0006	
			c	.1990	.1789	.1982	.0193	.0008	
	2,052,900	16,763,000	a	.1995	.1797	.1987	.0190	.0008	
			b	.1994	.1798	.1988	.0190	.0006	
			c	.1989	.1792	.1982	.0190	.0007	
	1,984,700	18,777,700	a	.1994	.1798	.1990	.0192	.0004	
			b	.1995	.1802	.1991	.0189	.0004	
			c	.1993	.1794	.1985	.0191	.0008	
	1,929,600	20,707,300	a	.1992	.1802	.1990	.0188	.0002	
			b	.1999	.1803	.1991	.0188	.0008	
			c	.1993	.1794	.1986	.0192	.0007	
	1,859,900	22,567,200	a	.1995	.1805	.1991	.0186	.0004	
			b	.1999	.1805	.1992	.0187	.0007	
			c	.1993	.1797	.1987	.0190	.0006	
	2,163,800	24,731,000	a	.1998	.1803	.1991	.0188	.0007	
			b	.1998	.1802	.1993	.0191	.0005	
			c	.1995	.1797	.1986	.0189	.0009	
	1,946,000	26,677,000	a	.2001	.1804	.1994	.0190	.0007	
			b	.1999	.1801	.1993	.0192	.0006	
			c	.1994	.1798	.1988	.0190	.0006	
	1,964,200	28,641,200	a	.2000	.1800	.1992	.0192	.0008	
			b	.1997	.1800	.1992	.0192	.0005	
			c	.1993	.1795	.1985	.0190	.0008	



2, 130, 800	30, 781, 000	a	.1896	.1893	.0190	.0003
		b	.2001	.1893	.0190	.0008
		c	.1894	.1897	.0189	.0007
1, 046, 000	32, 727, 000	a	.1898	.1893	.0189	.0005
		b	.1898	.1893	.0192	.0005
		c	.1896	.1888	.0192	.0008
1, 961, 600	34, 688, 600	a	.1897	.1894	.0189	.0003
		b	.2000	.1894	.0189	.0006
		c	.1896	.1889	.0192	.0007
1, 832, 150	36, 520, 750	a	.2008	.2006	.0180	.0002
		b	.2012	.2005	.0189	.0007
		c	.2010	.2000	.0190	.0010
535, 350	37, 056, 100	a	.2016	.2007	.0189	.0009
		b	.2013	.2007	.0188	.0006
		c	.2008	.2001	.0189	.0007
95, 800	37, 151, 900					

Bar removed from machine not ruptured.

## ENDURANCE TESTS OF ROTATING SHAFTS.

## GENERAL TABULATION OF RESULTS.

No. of test.	Material.	Marks.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Number of rotations.		Remarks.
					Successive.	Total.	
31	O. H. steel.....	1	400	<i>Pounds.</i>	10,000	10,000	
					20,000	20,000	
					30,000	30,000	
					40,000	40,000	
					50,000	50,000	
					60,000	60,000	
					70,000	70,000	
					80,000	80,000	
					90,000	90,000	
					100,000	100,000	
					110,000	110,000	
					120,000	120,000	
					130,000	130,000	
					140,000	140,000	
					150,000	150,000	
					160,000	160,000	
					170,000	170,000	
					180,000	180,000	
					190,000	190,000	
					200,000	200,000	
					210,000	210,000	
					220,000	220,000	
					230,000	230,000	
					240,000	240,000	
					250,000	250,000	
					260,000	260,000	
					270,000	270,000	
					280,000	280,000	
					290,000	290,000	
					300,000	300,000	
					310,000	310,000	
					320,000	320,000	
					330,000	330,000	
					340,410	340,410	Bar ruptured.
					23,100	23,100	Do.
					23,850	23,850	Do.
					54,850	54,850	Bar ruptured. Annealed six times at 580° to 595° F., at intervals of 5,000 rotations.
					49,400	49,400	Bar ruptured. Annealed four times at 595° F., at intervals of 10,000 rotations.
32	O. H. steel.....	1	400		23,100	23,100	Bar ruptured.
33	do.....	1	400		23,850	23,850	Do.
34	do.....	1	400		54,850	54,850	Bar ruptured.
35	do.....	1	400		49,400	49,400	Bar ruptured.

50	do	2	400	50,000	15,600	15,600	Bar ruptured.	Ann annealed at 500° F. after 13,000 rotations.
51	do	2	400	50,000	19,500	19,500	Bar ruptured.	Ann annealed twice at 500° F. after 13,000 and 23,000 rotations, respectively.
52	do	2	400	50,000	27,850	27,850	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
53	do	2	400	50,000	43,300	43,300	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
54	do	2	400	50,000	44,900	44,900	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
55	do	3	400	45,000	127,500	127,500	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 10,000 rotations, between 13,000 and 63,000 rotations.
56	do	3	400	45,000	116,900	116,900	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 10,000 rotations, between 13,000 and 63,000 rotations.
57	do	3	400	45,000	131,000	131,000	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
58	do	3	400	45,000	94,700	94,700	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
59	do	3	400	45,000	79,850	79,850	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
70	do	4	400	45,000	52,900	52,900	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
71	do	4	400	45,000	70,750	70,750	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
72	do	4	400	45,000	50,450	50,450	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
73	do	4	400	45,000	58,100	58,100	Bar ruptured.	Ann annealed six times at 500° F., at intervals of 5,000 rotations.
103	do	4	2,200	45,000	46,200	46,200	Bar ruptured.	Stream of cold water played on specimen during the test.
104	do	4	2,200	45,000	58,000	58,000	Bar ruptured.	Temperature during test ranged from 120° to 180° F.
105	do	4	2,200	45,000	54,000	54,000	Bar ruptured.	Stream of cold water played on specimen during the test.
106	do	4	2,200	45,000	57,000	57,000	Do.	Temperature reached about 500° F. at close of test.
74	do	5	400	45,000	2,000	2,000	Bar ruptured.	Stream of water played on specimen during the test.
	do	5	400	48,000	50,800	52,800	Bar ruptured.	Initially heated to the temperature of about 600° F.
	do	5	400	48,000	32,850	32,850	Bar ruptured.	Stream of cold water played on specimen during the test.
75	do	5	400	48,000	31,650	31,650	Bar ruptured.	Initially heated. Temperature of test about 180° F.
76	do	5	400	48,000	55,900	55,900	Bar ruptured.	Temperature of test about 200° F.
77	do	5	400	48,000	55,900	55,900	Bar ruptured.	Stream of cold water played on specimen during the test.
83	do	6	400	45,000	60,550	60,550	Bar ruptured.	Stream of cold water played on specimen during the test.
84	do	6	400	45,000	87,550	87,550	Bar ruptured.	Shaft gradually increased in temperature, reaching about 150° F. at close of test.
85	do	6	400	45,000	61,800	61,800	Bar ruptured.	Hot test. Maximum temperature, 420° F.
86	do	6	400	45,000	58,550	58,550	Bar ruptured.	Hot test. Maximum temperature, 395° F.
87	do	7	400	45,000	108,250	108,250	Bar ruptured.	Run hot for 30,000 rotations, maximum temperature 402° F., then cooled with water; 150° F. at close of test.
88	do	7	400	45,000	95,400	95,400	Bar ruptured.	Run hot for 30,000 rotations, maximum temperature 460° F., then cooled with water; 150° F. at close of test.
89	do	7	400	45,000	117,900	117,900	Bar ruptured.	Hot test. Maximum temperature, 425° F.
90	do	7	400	45,000	140,350	140,350	Bar ruptured.	Tested at 700° F. during 11,400 rotations, then run cold, 65° F., for remainder of test.
111	do	15	2,200	20,000	3,700	3,700	Bar ruptured.	Tested at 700° F. during 17,600 rotations, then run cold, 65° F., for remainder of test.
				36,300	40,000	40,000		
				20,050	60,050	60,050		
				59,950	160,000	160,000		
							Test discontinued.	



[illegible]

## ENDURANCE TESTS OF ROTATING SHAFTS—Continued.

## GENERAL TABULATION OF RESULTS—Continued.

No. of test.	Material.	Marks.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Number of rotations.		Remarks.
					Successive.	Total.	
95	Wrought iron	6a	400	<i>Pounds.</i>	158,400	158,400	Bar ruptured; tested at 500° F. for 29,100 rotations; completed cold.
92	do	7	400	35,000	60,700	60,700	Bar ruptured; tested at 550° F.
107	do	7	2,200	40,000	107,000	107,000	Bar ruptured; tested at 600° F.
100	do	8	2,200	40,000	39,200	39,200	Bar ruptured; tested cold; a stream of cold water played on shaft during the test.
101	do	8	2,200	40,000	66,200	66,200	Bar ruptured; tested at 450° F., the maximum temperature acquired during the test.
102	do	8	2,200	40,000	138,200	138,200	Bar ruptured; tested at 550° F., the maximum temperature acquired during the test.
108	do	8	2,200	45,000	56,800	56,800	Bar ruptured; tested at 600° F.; initially heated.
109	do	8	2,200	45,000	16,500	16,500	Bar ruptured; tested cold; a stream of water played on shaft during the test.
96	do	9	2,200	15,000	45,150	45,150	
				20,000	20,050	65,200	
				25,000	19,900	85,100	
				30,000	59,900	145,000	
				35,000	113,000	258,000	
97	do	9	2,200	40,000	161,000	161,000	Bar ruptured.
							Bar ruptured; test began cold; estimated temperature acquired during the test, 550° F.
98	do	9	2,200	40,000	40,000	40,000	Bar ruptured; tested cold; a stream of water played on shaft during the test.
99	do	9	2,200	40,000	34,700	34,700	Do.
30	Cast (gun) iron	4	400	15,000	87,151,900	37,151,900	Bar removed from machine; not ruptured.

---

## TENSILE TESTS OF SPECIMENS FROM BARS RUPTURED BY ENDURANCE TESTS OF ROTATING SHAFTS.

These specimens were taken from the outer ends of the shafts, next the bearing opposite the driving head.

The marks given are the numbers of the endurance tests.

---





## SPECIMENS FROM STEEL SHAFTS.

No. 4230.

Mark, 31.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	W.	0.	Initial load.
1,250	5,000	.0007	0.	
2,500	10,000	.0017	.....	
3,750	15,000	.0027	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0058	0.	
8,750	35,000	.0067	.....	
10,000	40,000	.0079	.....	
11,250	45,000	.0088	.....	
12,500	50,000	.0100	.....	
12,750	51,000	.0102	.....	
13,000	52,000	.0104	.....	
13,250	53,000	.0106	.....	
13,500	54,000	.0108	.....	
13,750	55,000	.0109	.....	
14,000	56,000	.0112	.....	
14,250	57,000	.0114	.....	
14,500	58,000	.0117	.....	Elastic limit. Load fell.
12,000	48,000	.0650	.....	
		.1700	.....	
12,250	49,000	.1723	.....	
12,500	50,000	.1785	.....	
13,000	52,000	.2100	.....	
13,500	54,000	.2540	.....	
14,000	56,000	.3060	.....	
14,500	58,000	.38	.....	
15,000	60,000	.48	.....	
15,500	62,000	.65	.....	
15,880	63,520	1.11	.....	Tensile strength.
0	0	1.60	.....	=26.7 per cent.

Elongation of inch sections, ".15, ".20, ".28, ".56\*, ".24, ".17.

Fractured 3".5 from the neck. Appearance, fine silky.

Diameter at fracture, ".32. Area, .0804 square inch.

Contraction, 67.8 per cent.

H. Ex. 165—67

No. 4231.

Mark, 32.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0058	.....	
8,750	35,000	.0068	.....	
10,000	40,000	.0079	—, 0001	
11,250	45,000	.0088	.....	
12,500	50,000	.0098	—, 0001	
12,750	51,000	.0099	.....	Elastic limit. Load fell.
11,500	46,000	.0508	.....	
11,750	47,000	.0598	.....	
12,000	48,000	.1605	.....	
12,250	49,000	.1646	.....	
12,500	50,000	.1778	.....	
12,750	51,000	.1921	.....	
13,000	52,000	.2190	.....	
13,500	54,000	.2730	.....	
14,000	56,000	.3175	.....	
14,500	58,000	.4050	.....	
15,000	60,000	.53	.....	
15,500	62,000	.73	.....	
15,730	62,920	1.16	.....	Tensile strength.
0	0	1.60	.....	= 26.7 per cent.

Elongation of inch sections, ".16, ".21, ".28, ".57\*, ".22, ".16.

Fractured 3".4 from the neck. Appearance, fine silky.

Diameter at fracture, ".32. Area, .0804 square inch.

Contraction, 67.8 per cent.

No. 4232.

Mark, 33.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	.....	
2,500	10,000	.0019	.....	
3,750	15,000	.0029	.....	
5,000	20,000	.0039	.....	
6,250	25,000	.0049	.....	
7,500	30,000	.0060	.....	
8,750	35,000	.0070	.....	
10,000	40,000	.0080	.0001	
11,250	45,000	.0091	.....	
11,500	46,000	.0093	.....	
11,750	47,000	.0095	.....	
12,000	48,000	.0097	.....	
12,250	49,000	.0099	.....	
12,500	50,000	.0101	.....	
12,750	51,000	.0103	.....	
13,000	52,000	.0105	.....	
13,250	53,000	.0107	.....	Elastic limit. Load fell.
11,500	46,000	.0400	.....	
11,750	47,000	.1565	.....	
12,000	48,000	.1640	.....	
12,250	49,000	.1725	.....	
12,500	50,000	.1920	.....	
12,750	51,000	.2100	.....	
13,000	52,000	.2300	.....	
13,250	53,000	.2500	.....	
13,500	54,000	.2870	.....	
13,750	55,000	.32	.....	
14,000	56,000	.36	.....	
14,250	57,000	.39	.....	
14,500	58,000	.42	.....	
15,000	60,000	.58	.....	
15,500	62,000	.82	.....	
15,700	62,800	.....	.....	Tensile strength.
0	0	1.57	.....	=26.2 per cent.

Elongation of inch sections, ".16, ".20, ".26, ".56\*, ".22, ".17.

Fractured 3".25 from the neck. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction, 69.8 per cent.

No. 4233.

Mark, 34.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	.....	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0017	.....	
3,750	15,000	.0027	.....	
5,000	20,000	.0036	.....	
6,250	25,000	.0046	.....	
7,500	30,000	.0057	.....	
8,750	35,000	.0067	.....	
10,000	40,000	.0077	0.	
11,250	45,000	.0087	.....	
12,000	48,000	.0097	.....	Elastic limit. Load fell.
12,250	49,000	.0098	.....	
12,500	50,000	.0100	.....	
12,750	51,000	.0101	.....	
13,000	52,000	.0102	.....	
11,500	46,000	.0185	.....	
11,000	44,000	.0924	.....	
11,250	45,000	.1000	.....	
11,500	46,000	.1300	.....	
11,750	47,000	.1500	.....	
12,000	48,000	.1640	.....	
12,250	49,000	.1785	.....	
12,500	50,000	.1917	.....	
12,750	51,000	.2120	.....	
13,000	52,000	.2340	.....	
13,250	53,000	.2555	.....	
13,500	54,000	.2870	.....	
13,750	55,000	.31	.....	
14,000	56,000	.36	.....	
14,500	58,000	.46	.....	
15,000	60,000	.58	.....	
15,500	62,000	.86	.....	
15,580	62,320	1.18	.....	Tensile strength. =26.7 per cent.
0	0	1.60	.....	

Elongation of inch sections, ".16, ".24, ".57\*, ".23, ".21, ".19.

Fractured 3".1 from the neck. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction, 69.8 per cent.

No. 4213.

Marks, 50.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0011	0.	
2,500	10,000	.0022	.....	
3,750	15,000	.0032	0.	
5,000	20,000	.0041	.....	
6,250	25,000	.0051	0.	
7,500	30,000	.0061	0.	
8,750	35,000	.0070	0.	
10,000	40,000	.0081	0.	
11,250	45,000	.0093	0.	
11,500	46,000	.0095	.....	
11,750	47,000	.0098	.....	Elastic limit. Load fell.
12,000	48,000	.0098	.....	
12,250	49,000	.2525	.....	
12,500	50,000	.28	.....	
12,750	51,000	.30	.....	
13,000	52,000	.33	.....	
13,250	53,000	.37	.....	
13,500	54,000	.40	.....	
13,750	55,000	.43	.....	
14,000	56,000	.48	.....	
14,250	57,000	.52	.....	
14,500	58,000	.60	.....	Tensile strength. =29.2 per cent.
14,750	59,000	.67	.....	
15,000	60,000	.80	.....	
15,250	61,000	.89	.....	
15,500	62,000	1.12	.....	
15,520	62,080	1.40	.....	
0	0	1.75	.....	

Elongation of inch sections, ".20, ".25, ".30, ".56\*, ".24, ".20.  
 Fractured near the middle of stem. Appearance, fine silky.  
 Diameter at fracture, ".33. Area, .0855 square inch. —  
 Contraction of area, 65.8 per cent.

No. 4234.

Mark, 51.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0019	.....	
3,750	15,000	.0029	.....	
5,000	20,000	.0039	.....	
6,250	25,000	.0050	.....	
7,500	30,000	.0060	.....	
8,750	35,000	.0070	.....	
10,000	40,000	.0080	.0001	
11,250	45,000	.0092	.....	
11,500	46,000	.0094	.....	
11,750	47,000	.0096	.....	
11,000	44,000	.1150	.....	
11,250	45,000	.2015	.....	
11,500	46,000	.2160	.....	
11,750	47,000	.2258	.....	Elastic limit. Load fell.
12,000	48,000	.2480	.....	
12,250	49,000	.2600	.....	
12,500	50,000	.2820	.....	
12,750	51,000	.3060	.....	
13,000	52,000	.3350	.....	
13,250	53,000	.37	.....	
13,500	54,000	.40	.....	
13,750	55,000	.42	.....	
14,000	56,000	.49	.....	
14,250	57,000	.55	.....	
14,500	58,000	.58	.....	
14,750	59,000	.66	.....	
15,000	60,000	.78	.....	
15,500	62,000	1.18	.....	
15,520	62,080	.....	.....	Tensile strength.
0	0	1.80	.....	= 30 per cent.

Elongation of inch sections, ".18, ".25, ".28, ".59\*, ".28, ".22.

Fractured 2".85 from the neck. Appearance, fine silky.

Diameter at fracture, ".32. Area, .0804 square inch.

Contraction of area, 67.8 per cent.

No. 4214.

Mark, 55.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0019	0.	
3,750	15,000	.0027	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0059	0.	
8,750	35,000	.0068	.....	
10,000	40,000	.0079	0.	
11,250	45,000	.0090	.0001	
12,000	48,000	.0097	.....	
12,250	49,000	.2170	.....	Elastic limit. Load fell.
12,500	50,000	.....	.....	
12,750	51,000	.....	.....	
13,000	52,000	.2980	.....	
13,250	53,000	.3175	.....	
13,500	54,000	.34	.....	
13,750	55,000	.37	.....	
14,000	56,000	.41	.....	
14,250	57,000	.46	.....	
14,500	58,000	.50	.....	
14,750	59,000	.54	.....	
15,000	60,000	.62	.....	Tensile strength. =29.8 per cent.
15,250	61,000	.68	.....	
15,500	62,000	.78	.....	
15,750	63,000	.90	.....	
15,890	63,560	1.31	.....	
0	0	.....	.....	

Elongation of inch sections, ".20, ".26, ".59\*, ".27, ".25, ".22.

Fractured 3" from the neck. Appearance, fine silky.

Diameter at fracture, ".33. Area, .0855 square inch.

Contraction of area, 65.8 per cent.

No. 4235.

Mark, 70.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0021	.....	
3,750	15,000	.0031	.....	
5,000	20,000	.0042	.....	
6,250	25,000	.0052	.....	
7,500	30,000	.0062	.....	
8,750	35,000	.0073	.....	
10,000	40,000	.0084	.0002	
11,250	45,000	.0095	.....	Elastic limit.
11,500	46,000	.0098	.....	Load fell.
10,000	40,000	.0180	.....	
10,250	41,000	.0250	.....	
10,500	42,000	.0540	.....	
10,000	40,000	.0907	.....	
10,250	41,000	.1025	.....	
10,500	42,000	.1100	.....	
10,750	43,000	.1191	.....	
10,000	40,000	.1690	.....	
10,250	41,000	.1756	.....	
10,500	42,000	.1792	.....	
10,750	43,000	.1837	.....	
11,000	44,000	.1930	.....	Rested 1½ hours.
11,250	45,000	.2080	.....	
11,500	46,000	.2238	.....	
11,750	47,000	.2375	.....	
12,000	48,000	.2610	.....	
12,500	50,000	.32	.....	
13,000	52,000	.37	.....	
13,500	54,000	.44	.....	
14,000	56,000	.54	.....	
14,500	58,000	.70	.....	
15,000	60,000	.98	.....	
15,020	60,080	.....	.....	Tensile strength.
0	0	1.83	.....	=30.5 per cent.

Elongation of inch sections, ".19, ".24, ".33, ".59\*, ".26, ".22.

Fractured 3".5 from the neck. Appearance, fine silky.

Diameter at fracture, ".32. Area, .0804 square inch.

Contraction of area, 67.8 per cent.



No. 4236.

Mark, 71.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Persquare inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0022	.....	
3,750	15,000	.0032	.....	
5,000	20,000	.0042	.....	
6,250	25,000	.0053	.....	
7,500	30,000	.0064	.0002	
8,750	35,000	.0076	.....	
10,000	40,000	.0087	.0002	
10,250	41,000	.0089	.....	
10,500	42,000	.0091	.....	
10,750	43,000	.0092	.....	
11,000	44,000	.0095	.....	
11,250	45,000	.0097	.....	
11,500	46,000	.0100	.....	
11,750	47,000	.0102	.....	Elastic limit. Load fell.
10,750	43,000	.0220	.....	
10,250	41,000	.0617	.....	
10,500	42,000	.0880	.....	
10,750	43,000	.1080	.....	
11,000	44,000	.1917	.....	
11,250	45,000	.1968	.....	
11,500	46,000	.2090	.....	
11,750	47,000	.2250	.....	
12,000	48,000	.2460	.....	
12,250	49,000	.2617	.....	
12,500	50,000	.30	.....	
12,750	51,000	.32	.....	
13,000	52,000	.34	.....	
13,500	54,000	.42	.....	
14,000	56,000	.52	.....	
14,500	58,000	.64	.....	
15,000	60,000	.83	.....	
15,240	60,860	1.27	.....	Tensile strength.
0	0	1.78	.....	= 29.7 per cent.

Elongation of inch sections, ".18, ".23, ".27, ".61\*, ".28, ".21.

Fractured 3".25 from the neck. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction of area, 69.8 per cent.

No. 4237.

Marks, 72.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0020	.....	
3,750	15,000	.0029	.....	
5,000	20,000	.0039	.....	
6,250	25,000	.0050	.....	
7,500	30,000	.0060	0.	
8,750	35,000	.0069	.....	
10,000	40,000	.0081	0.	
10,750	43,000	.0088	.....	
11,000	44,000	.0090	.....	
11,250	45,000	.0092	.....	Elastic limit.
11,500	46,000	.0097	.....	Load fell.
9,750	39,000	.0127	.....	
10,000	40,000	.0137	.....	
10,250	41,000	.0159	.....	
10,500	42,000	.0325	.....	
10,750	43,000	.1304	.....	
11,000	44,000	.1890	.....	
11,250	45,000	.2045	.....	
11,500	46,000	.2210	.....	
11,750	47,000	.2360	.....	
12,000	48,000	.2540	.....	
12,250	49,000	.2750	.....	
12,500	50,000	.3070	.....	
13,000	52,000	.38	.....	
13,500	54,000	.43	.....	
14,000	56,000	.56	.....	
14,500	58,000	.71	.....	
15,000	60,000	.97	.....	
15,120	60,480	1.29	.....	Tensile strength.
0	0	1.76	.....	=29.3 per cent.

Elongation of inch sections, ".19, ".23, ".26, ".62\*, ".26, ".20.

Fractured 3".25 from the neck. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction of area, 69.8 per cent.

No. 4238.

Mark, 73.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0049	.....	
7,500	30,000	.0060	.....	
8,750	35,000	.0072	.....	
10,000	40,000	.0083	0.	
11,250	45,000	.0098	.....	
11,500	46,000	.0100	.....	
11,750	47,000	.0103	.....	Elastic limit. Load fell.
11,000	44,000	.0460	.....	
11,260	45,000	.1350	.....	
11,500	46,000	.1975	.....	
11,750	47,000	.2100	.....	
12,000	48,000	.2340	.....	
12,250	49,000	.2450	.....	
12,500	50,000	.2750	.....	
13,000	52,000	.3250	.....	
13,500	54,000	.39	.....	
14,000	56,000	.48	.....	
14,500	58,000	.60	.....	
15,000	60,000	.81	.....	
15,310	61,240	1.28	.....	Tensile strength.
0	0	1.79	.....	=29.8 per cent.

Elongation of inch sections, ".20, ".27, ".62\*, ".31, ".23, ".16.

Fractured 3".5 from the neck. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction of area, 69.8 per cent.

No. 4239.

Mark, 74.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0021	.....	
3,750	15,000	.0031	.....	
5,000	20,000	.0042	.....	
6,250	25,000	.0052	.....	
7,500	30,000	.0062	.....	
8,750	35,000	.0074	.....	
10,000	40,000	.0086	.0002	
11,250	45,000	.0097	.....	
12,500	50,000	.0107	.....	
12,750	51,000	.0108	.....	Elastic limit.
13,000	52,000	.0120	.....	Load fell.
11,500	46,000	.0162	.....	
11,750	47,000	.0390	.....	
12,000	48,000	.2050	.....	
12,250	49,000	.2110	.....	
12,500	50,000	.2305	.....	
12,750	51,000	.2470	.....	
13,000	52,000	.2750	.....	
13,250	53,000	.2980	.....	
13,500	54,000	.3360	.....	
14,000	56,000	.41	.....	
14,500	58,000	.52	.....	
15,000	60,000	.69	.....	
15,410	61,640	1.19	.....	Tensile strength.
0	0	1.60	.....	= 26.7 per cent.

Elongation of inch sections, ".17, ".20, ".25, ".57\*, ".24, ".17.

Fractured 3".25 from the neck. Appearance, fine silky.

Diameter at fracture, ".32. Area, .0804 square inch.

Contraction of area, 67.8 per cent.

No. 4240.

Mark, 75.

Diameter, ".564.

Sectional area, 25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	.....	
2,500	10,000	.0019	.....	
3,750	15,000	.0029	.....	
5,000	20,000	.0040	.....	
6,250	25,000	.0051	.....	
7,500	30,000	.0061	.....	
8,750	35,000	.0071	.....	
10,000	40,000	.0082	0.	
11,250	45,000	.0091	.....	
12,500	50,000	.0102	.....	Elastic limit. Load fell.
11,250	45,000	.0231	.....	
11,500	46,000	.1080	.....	
11,750	47,000	.1878	.....	
12,000	48,000	.2040	.....	
12,250	49,000	.2165	.....	
12,500	50,000	.2335	.....	
12,750	51,000	.2517	.....	
13,000	52,000	.2890	.....	
13,500	54,000	.36	.....	
14,000	56,000	.43	.....	Tensile strength. = 28.5 per cent.
14,500	58,000	.57	.....	
15,000	60,000	.74	.....	
15,500	62,000	1.39	.....	
0	0	1.71	.....	

Elongation of inch sections, ".18, ".24, ".30, ".57\*, ".23, ".19.

Fractured 3".4 from the neck. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction of area, 69.8 per cent.

No. 4241.

Mark, 76.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0019	.....	
3,750	15,000	.0029	.....	
5,000	20,000	.0039	.....	
6,250	25,000	.0059	.....	
7,500	30,000	.0060	.....	
8,750	35,000	.0070	.....	
10,000	40,000	.0080	.0001	
11,250	45,000	.0091	.....	
12,000	48,000	.0098	.....	
12,250	49,000	.0100	.....	Elastic limit. Load fell.
11,000	44,000	.0250	.....	
11,250	45,000	.0095	.....	
11,500	46,000	.1740	.....	
11,750	47,000	.1817	.....	
12,000	48,000	.2000	.....	
12,250	49,000	.2160	.....	
12,500	50,000	.2380	.....	
12,750	51,000	.2570	.....	
13,000	52,000	.2870	.....	
13,500	54,000	.36	.....	
14,000	56,000	.44	.....	
14,500	58,000	.57	.....	
15,000	60,000	.78	.....	
15,260	61,040	1.20	.....	Tensile strength.
0	0	1.67	.....	= 27.8 per cent.

Elongation of inch sections, ".17, ".23, ".49\*, ".37, ".22, ".19.

Fractured at middle of stem. Appearance, fine silky.

Diameter at fracture, ".31. Area, .0754 square inch.

Contraction of area, 69.8 per cent.

No. 4242.

Mark, 77.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0058	.....	
8,750	35,000	.0069	.....	
10,000	40,000	.0079	0.	
11,250	45,000	.0089	.....	
11,500	46,000	.0091	.....	
11,750	47,000	.0093	.....	
12,000	48,000	.0096	.....	
12,250	49,000	.0099	.....	
12,500	50,000	.0101	.....	
12,750	51,000	.0103	.....	
13,000	52,000	.0105	.....	
13,250	53,000	.0107	.....	
13,500	54,000	.0109	.....	
13,750	55,000	.0111	.....	Elastic limit.
11,750	47,000	.0172	.....	
12,000	48,000	.0257	.....	
11,750	47,000	.0360	.....	
12,000	48,000	.0740	.....	
12,250	49,000	.1940	.....	
12,500	50,000	.2170	.....	
12,750	51,000	.2320	.....	
13,000	52,000	.2500	.....	
13,250	53,000	.2750	.....	
13,500	54,000	.3075	.....	
13,750	55,000	.3340	.....	
14,000	56,000	.37	.....	
14,250	57,000	.41	.....	
14,500	58,000	.48	.....	
14,750	59,000	.52	.....	
15,000	60,000	.65	.....	
15,250	61,000	.73	.....	
15,500	62,000	.97	.....	
15,520	62,080	1.20	.....	Tensile strength. = 26.8 per cent.
0	0	1.61	.....	

Elongation of inch sections, ".15, ".20, ".23, ".56\*, ".28, ".19.

Fractured 2".75 from the neck. Appearance, fine silky.

Diameter at fracture, ".32. Area, .0804 square inch.

Contraction of area, 67.8 per cent.

## SPECIMENS FROM WROUGHT-IRON SHAFTS.

No. 4248.

Mark, 41.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0039	.....	
6,250	25,000	.0049	.....	
7,500	30,000	.0059	0.	
7,750	31,000	.0061	.....	
8,000	32,000	.0063	.....	
8,250	33,000	.0065	.....	
8,500	34,000	.0068	.....	
8,750	35,000	.0070	.....	
9,000	36,000	.0071	.....	Elastic limit. Load fell.
7,500	30,000	.0101	.....	
7,750	31,000	.0141	.....	
8,000	32,000	.0212	.....	
8,250	33,000	.0375	.....	
8,500	34,000	.0653	.....	
8,750	35,000	.1440	.....	
8,000	32,000	.1960	.....	
8,250	33,000	.2010	.....	
8,500	34,000	.2068	.....	
9,000	36,000	.22	.....	
9,500	38,000	.28	.....	
10,000	40,000	.34	.....	
10,500	42,000	.41	.....	
11,000	44,000	.53	.....	
11,500	46,000	.72	.....	
12,000	48,000	1.08	.....	
12,020	48,080	1.39	.....	Tensile strength.
0	0	1.64	.....	= 27.3 per cent.

Elongation of inch sections, ".19, ".43\*, ".32, ".27, ".22, ".21.

Fractured 2."25 from the neck. Appearance, fibrous.

Diameter at fracture, ".41. Area, .132 square inch.

Contraction of area, 47.2 per cent.



No. 4249.

Mark, 42.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, .6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongations	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0049	.....	
7,500	30,000	.0060	0.	
7,750	31,000	.0061	.....	
8,000	32,000	.0063	.....	
8,250	33,000	.0066	.....	
8,500	34,000	.0068	.....	Elastic limit. Load fell.
7,750	31,000	.0158	.....	
8,000	32,000	.0317	.....	
8,250	33,000	.0440	.....	
8,500	34,000	.0650	.....	
8,000	32,000 {	.0780	.....	
8,250	33,000	.0868	.....	
8,500	34,000	.1017	.....	
8,750	35,000	.1300	.....	
9,000	36,000	.2040	.....	
9,250	37,000	.2165	.....	
9,500	38,000	.2365	.....	
9,750	39,000	.2680	.....	
10,000	40,000	.2925	.....	
10,500	42,000	.3325	.....	
11,000	44,000	.41	.....	
11,500	46,000	.52	.....	
11,960	47,840	.71	.....	
0	0	1.28	.....	Tensile strength, = 25.0 per cent.
		1.50	.....	

Elongation of inch sections, ".20, ".48\*, ".23, ".21, ".20, ".18.

Fractured 1".65 from the neck. Appearance, fibrous.

Diameter at fracture, ".40. Area, .1257 square inch.

Contraction of area, 49.7 per cent.

H. Ex. 165—68

No. 4209.

Mark, 43.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0007	.....	
2,500	10,000	.0020	.....	
3,750	15,000	.0031	.....	
5,000	20,000	.0041	.....	
6,250	25,000	.0051	.....	
7,500	30,000	.0061	.....	
7,750	31,000	.0063	.....	
8,000	32,000	.0065	.....	
8,250	33,000	.0068	.....	Elastic limit. Load fell.
8,500	34,000	.1900	.....	
8,750	35,000	.21	.....	
9,000	36,000	.22	.....	
9,250	37,000	.25	.....	
9,500	38,000	.28	.....	
9,750	39,000	.31	.....	
10,000	40,000	.35	.....	
10,250	41,000	.39	.....	
10,500	42,000	.44	.....	
10,750	43,000	.48	.....	
11,000	44,000	.58	.....	
11,250	45,000	.64	.....	
11,500	46,000	.79	.....	
11,750	47,000	.94	.....	
11,890	47,560	1.42	.....	Tensile strength.
0	0	1.62	.....	=27.6 per cent.

Elongation of inch sections, ".24, ".52\*, ".25, ".22, ".21, ".18.

Fractured 1".8 from the neck. Appearance, fibrous.

Diameter at fracture, ".41. Area, .132 square inch.

Contraction of area, 4.27 per cent.

No. 4210.

Mark, 44.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	0.	
2,500	10,000	.0020	-----	
3,750	15,000	.0030	0.	
5,000	20,000	.0041	.0001	
6,250	25,000	.0051	.0001	
7,500	30,000	.0062	.0001	
7,750	31,000	.0064	-----	
8,000	32,000	.0067	-----	
8,250	33,000	.0068	-----	
8,500	34,000	.0071	-----	Elastic limit. Load fell.
8,750	35,000	.1915	-----	
9,000	36,000	.22	-----	
9,250	37,000	.27	-----	
9,500	38,000	.29	-----	
9,750	39,000	.31	-----	
10,000	40,000	.34	-----	
10,250	41,000	.39	-----	
10,500	42,000	.42	-----	
10,750	43,000	.48	-----	
11,000	44,000	.58	-----	Tensile strength. =24.2 per cent.
11,250	45,000	.63	-----	
11,500	46,000	.79	-----	
11,750	47,000	1.00	-----	
11,820	47,280	1.29	-----	
0	0	1.45	-----	

Elongation of inch sections, ".15, ".20, ".21, ".26, ".45\*, ".18.

Fractured 2".25 from the neck. Appearance, fibrous.

Diameter at fracture, ".39. Area, .119 square inch.

Contraction of area, 52.2 per cent.

No. 4250.

Mark, 45.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0020	.....	
3,750	15,000	.0030	.....	
5,000	20,000	.0041	.....	
6,250	25,000	.0052	.....	
7,500	30,000	.0064	.....	
8,750	35,000	.0066	.....	
10,000	40,000	.0069	.....	
11,250	45,000	.0071	.....	
12,500	50,000	.0073	.....	
13,750	55,000	.0076	.....	
15,000	60,000	.0078	.....	Elastic limit. Load fell.
16,250	65,000	.0248	.....	
17,500	70,000	.0413	.....	
18,750	75,000	.0455	.....	
20,000	80,000	.0778	.....	
21,250	85,000	.1310	.....	
22,500	90,000	.1520	.....	
23,750	95,000	.1580	.....	
25,000	100,000	.1740	.....	
26,250	105,000	.1920	.....	
27,500	110,000	.2150	.....	
28,750	115,000	.27	.....	
30,000	120,000	.31	.....	
31,250	125,000	.38	.....	
32,500	130,000	.47	.....	
33,750	135,000	.59	.....	
35,000	140,000	.82	.....	
36,250	145,000	1.17	.....	Tensile strength.
37,500	150,000	1.54	.....	= 25.7 per cent.

Elongation of inch sections, ".23, ".45\*, ".28, ".22, ".19, ".17.  
 Fractured 2".25 from the neck. Appearance, fibrous, lamellar.  
 Diameter at fracture, ".42. Area, .1385 square inch.  
 Contraction of area, 44.6 per cent.

No. 4211.

Mark, 46.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008		
2,500	10,000	.0019		
3,750	15,000	.0029		
5,000	20,000	.0040		
6,250	25,000	.0049		
7,500	30,000	.0060		
7,750	31,000	.0062		
8,000	32,000	.0064		
8,250	33,000	.0067		
8,500	34,000	.0070		
8,750	35,000	.0072		
9,000	36,000	.0074		
9,250	37,000	.0076		
9,500	38,000	.0079		Elastic limit. Load fell.
9,750	39,000	.1840		
10,000	40,000	.1980		
10,250	41,000	.22		
10,500	42,000	.24		
10,750	43,000	.27		
11,000	44,000	.29		
11,250	45,000	.32		
11,500	46,000	.36		
11,750	47,000	.39		
12,000	48,000	.42		
12,250	49,000	.48		
12,500	50,000	.56		
12,750	51,000	.60		
13,000	52,000	.72		
13,250	53,000	.83		
13,500	54,000	1.19		Tensile strength.
0	0	1.41		=23.5 per cent.

Elongation of inch sections, ".19, ".23, ".26, ".36\*, ".20, ".17.

Fractured 3".25 from the neck. Appearance, fibrous, lamellar.

Diameter at fracture, ".43. Area, .145 square inch.

Contraction of area, 41.9 per cent.

No. 4211 $\frac{1}{2}$ .

Mark, 48.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	0.	
2,500	10,000	.0018	-----	
3,750	15,000	.0028	0.	
5,000	20,000	.0038	-----	
6,250	25,000	.0048	0.	
7,500	30,000	.0058	0.	
7,750	31,000	.0060	-----	
8,000	32,000	.0062	-----	
8,250	33,000	.0066	-----	
8,500	34,000	.0068	-----	Elastic limit. Load fell.
8,750	35,000	.0069	-----	
9,000	36,000	.0071	-----	
9,250	37,000	.0072	-----	
9,500	38,000	.1685	-----	
9,750	39,000	.1750	-----	
10,000	40,000	.1950	-----	
10,250	41,000	.2050	-----	
10,500	42,000	.226	-----	
10,750	43,000	.244	-----	
11,000	44,000	.27	-----	
11,250	45,000	.30	-----	
11,500	46,000	.33	-----	
11,750	47,000	.37	-----	
12,000	48,000	.40	-----	
12,250	49,000	.43	-----	
12,500	50,000	.49	-----	
12,750	51,000	.55	-----	
13,000	52,000	.64	-----	
13,250	53,000	.75	-----	
13,500	54,000	.96	-----	Tensile strength. =24.0 per cent.
13,740	54,960	1.30	-----	
0	0	1.44	-----	

Elongation of inch sections, ".19, ".25, ".36\*, ".24, ".21, ".19.

Fractured 3".25 from the neck. Appearance, fibrous lamellar.

Diameter at fracture, ".45. Area, .159 square inch.

Contraction of area, 36.4 per cent.

No. 4212.

Mark, 49.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	0.	
2,500	10,000	.0017	-----	
3,750	15,000	.0027	- 0.	
5,000	20,000	.0038	-----	
6,250	25,000	.0048	0.	
7,500	30,000	.0058	0.	
7,750	31,000	.0059	-----	
8,000	32,000	.0062	-----	
8,250	33,000	.0064	-----	
8,500	34,000	.0067	-----	Elastic limit. Load fell.
8,750	35,000	.0068	-----	
9,000	36,000	.0070	-----	
9,250	37,000	.0072	-----	
9,500	38,000	.1710	-----	
9,750	39,000	.1775	-----	
10,000	40,000	.1910	-----	
10,250	41,000	.2090	-----	
10,500	42,000	.2290	-----	
10,750	43,000	.2475	-----	
11,000	44,000	.2760	-----	
11,250	45,000	.2970	-----	
11,500	46,000	.3310	-----	
11,750	47,000	.37	-----	
12,000	48,000	.40	-----	
12,250	49,000	.44	-----	
12,500	50,000	.50	-----	
12,750	51,000	.55	-----	
13,000	52,000	.68	-----	
13,250	53,000	.77	-----	
13,500	54,000	.98	-----	Tensile strength. =25.5 per cent.
13,610	54,440	1.28	-----	
0	0	1.53	-----	

Elongation of inch sections, ".20, ".26, ".45\*, ".23, ".20, ".19.

Fractured 3"/2 from the neck. Appearance, fibrous, lamellar.

Diameter at fracture, ".43. Area, .145 square inch.

Contraction of area, 41.9 per cent.

No. 4245.

Marks, 36.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0040	.....	
6,250	25,000	.0050	.....	
7,500	30,000	.0062	0.	
7,750	31,000	.0064	.....	Elastic limit. Load fell.
7,500	30,000	.0380	.....	
7,750	31,000	.0555	.....	
8,000	32,000	.0705	.....	
8,250	33,000	.0875	.....	
8,500	34,000	.1260	.....	
8,750	35,000	.1550	.....	
9,000	36,000	.1735	.....	
9,250	37,000	.1860	.....	
9,500	38,000	.2210	.....	
9,750	39,000	.2335	.....	
10,000	40,000	.2575	.....	
10,250	41,000	.28	.....	
10,500	42,000	.32	.....	
11,000	44,000	.41	.....	
11,500	46,000	.50	.....	
12,000	48,000	.66	.....	
12,500	50,000	.91	.....	
12,680	50,720	1.20	.....	Tensile strength.
0	0	1.51	.....	=25.2 per cent.

Elongation of inch sections, ".45\*, ".25, ".27, ".24, ".17, ".13.

Fractured 1" from the neck. Appearance, fibrous.

Diameter at fracture, ".41 Area, .132 square inch.

Contraction of area, 47.2 per cent.



No. 4243.

Mark, 37.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0059	0.	
7,750	31,000	.0061	.....	
8,000	32,000	.0063	.....	
8,250	33,000	.0066	.....	
8,500	34,000	.0068	.....	Elastic limit.
8,750	35,000	.0085	.....	Load fell.
8,000	32,000	.0335	.....	
8,250	33,000	.0980	.....	
8,500	34,000	.1550	.....	
8,750	35,000	.1640	.....	
9,000	36,000	.1850	.....	
9,250	37,000	.2040	.....	
9,500	38,000	.2280	.....	
9,750	39,000	.2570	.....	
10,000	40,000	.2860	.....	
10,250	41,000	.31	.....	
10,500	42,000	.36	.....	
10,750	43,000	.39	.....	
11,000	44,000	.44	.....	
11,250	45,000	.50	.....	
11,500	46,000	.57	.....	
11,750	47,000	.64	.....	
12,000	48,000	.78	.....	
12,250	49,000	.91	.....	
12,450	49,800	1.36	.....	Tensile strength.
0	0	1.62	.....	=27 per cent.

Elongation of inch sections, ".22, ".48\*, ".28, ".25, ".21, ".18.

Fractured 2" from the neck. Appearance fibrous.

Diameter at fracture, ".41. Area, .132 square inch.

Contraction of area, 47.2 per cent.

No. 4244.

Mark, 38.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0058	0.	
8,000	32,000	.0062	.....	
8,250	33,000	.0064	.....	Elastic limit.
8,500	34,000	.0072	.....	Load fell
7,500	30,000	.0142	.....	
7,750	31,000	.0220	.....	
8,000	32,000	.0370	.....	
8,250	33,000	.0625	.....	
8,500	34,000	.1740	.....	
8,750	35,000	.1785	.....	
9,000	36,000	.1925	.....	
9,250	37,000	.2080	.....	
9,500	38,000	.2420	.....	
9,750	39,000	.26	.....	
10,000	40,000	.30	.....	
10,500	42,000	.37	.....	
11,000	44,000	.47	.....	
11,500	46,000	.59	.....	
12,000	48,000	.80	.....	
12,430	49,720	1.30	.....	Tensile strength.
0	0	1.62	.....	=27.0 per cent.

Elongation of inch sections, ".19, ".26, ".47\*, ".24, ".23, ".23.

Fractured 2".75 from the neck. Appearance, fibrous.

Diameter at fracture, ".39. Area, .1194 square inch.

Contraction of area, 52.2 per cent.

No. 4246.

Mark, 39.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0058	0.	
7,750	31,000	.0060	.....	
8,000	32,000	.0063	.....	Elastic limit. Load fell.
7,500	30,000	.0167	.....	
7,750	31,000	.0218	.....	
8,000	32,000	.0427	.....	
8,250	33,000	.0970	.....	
8,500	34,000	.1750	.....	
8,750	35,000	.1857	.....	
9,000	36,000	.2027	.....	
9,250	37,000	.23	.....	
9,500	38,000	.27	.....	
10,000	40,000	.31	.....	
10,500	42,000	.39	.....	
11,000	44,000	.47	.....	
11,500	46,000	.60	.....	
12,000	48,000	.83	.....	
12,370	49,450	1.40	.....	Tensile strength.
0	0	1.67	.....	=27.8 per cent.

Elongation of inch sections, ".20, ".46\*, ".33, ".24, ".23, ".21.

Fractured 2."5 from the neck. Appearance, fibrous.

Diameter at fracture, ".39. Area, .1194 square inch.

Contraction of area, 52.2 per cent.

No. 4247.

Mark, 40.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0040	.....	
6,250	25,000	.0051	.....	
7,500	30,000	.0062	0.	
7,750	31,000	.0063	.....	
8,000	32,000	.0068	.....	
7,500	30,000	.0095	.....	Elastic limit. Load fell.
7,750	31,000	.0138	.....	
8,000	32,000	.0365	.....	
8,250	33,000	.0870	.....	
8,500	34,000	.1630	.....	
8,750	35,000	.1765	.....	
9,000	36,000	.1987	.....	
9,250	37,000	.2220	.....	
9,500	38,000	.2470	.....	
9,750	39,000	.2660	.....	
10,000	40,000	.3065	.....	Tensile strength. = 25.2 per cent.
10,500	42,000	.38	.....	
11,000	44,000	.48	.....	
11,500	46,000	.60	.....	
12,000	48,000	.82	.....	
12,420	49,680	1.13	.....	
0	0	1.51	.....	

Elongation of inch sections, ".16, ".20, ".20, ".27, ".48\*, ".20.

Fractured 2".25 from the neck. Appearance, fibrous.

Diameter at fracture, ".39. Area, .1194 square inch.

Contraction of area, 52.2 per cent.

No. 4215.

Mark, 60.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Persquare inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	-----	
2,500	10,000	.0018	-----	
3,750	15,000	.0028	0.	
5,000	20,000	.0040	-----	
6,250	25,000	.0050	0.	
7,500	30,000	.0061	0.	
7,750	31,000	.0062	-----	
8,000	32,000	.0065	-----	
8,250	33,000	.0067	-----	
8,500	34,000	.0070	-----	
8,750	35,000	.0072	-----	
9,000	36,000	.0074	-----	
9,250	37,000	.1595	-----	Elastic limit. Load fell.
9,500	38,000	.1800	-----	
9,750	39,000	.1980	-----	
10,000	40,000	.2230	-----	
10,250	41,000	.2440	-----	
10,500	42,000	.2720	-----	
10,750	43,000	.2960	-----	
11,000	44,000	.3300	-----	
11,250	45,000	.3640	-----	
11,500	46,000	.42	-----	
11,750	47,000	.47	-----	
12,000	48,000	.52	-----	
12,250	49,000	.58	-----	
12,500	50,000	.70	-----	
12,750	51,000	.80	-----	
13,000	52,000	1.02	-----	Tensile strength. =26.7 per cent.
13,070	52,280	1.32	-----	
0	0	1.60	-----	

Elongation of inch sections, ".19, ".21, ".27, ".49\*, ".23, ".21.

Fractured 3".25 from the neck. Appearance, fibrous.

Diameter at fracture, ".40. Area, .126 square inch.

Contraction of area, 49.7 per cent.

No. 4216.

Marks, 65.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	0.	
2,500	10,000	.0020	0.	
3,750	15,000	.0030	0.	
5,000	20,000	.0040	0.	
6,250	25,000	.0050	0.	
7,500	30,000	.0060	0.	
7,750	31,000	.0062	.....	
8,000	32,000	.0065	.....	
8,250	33,000	.0067	.....	
8,500	34,000	.0070	.....	
8,750	35,000	.0072	.....	
9,000	36,000	.0075	.....	
9,250	37,000	.0077	.....	
9,500	38,000	.0079	.....	
9,750	39,000	.1890	.....	Elastic limit. Load fell. Stretching continued under 34,000 pounds per square inch tension.
10,000	40,000	.2125	.....	
10,250	41,000	.2290	.....	
10,500	42,000	.2500	.....	
10,750	43,000	.2730	.....	
11,000	44,000	.3025	.....	
11,250	45,000	.3250	.....	
11,500	46,000	.3675	.....	
11,750	47,000	.40	.....	
12,000	48,000	.46	.....	
12,250	49,000	.50	.....	
12,500	50,000	.59	.....	
12,750	51,000	.67	.....	Tensile strength. = 25.0 per cent.
13,000	52,000	.82	.....	
13,250	53,000	1.00	.....	
13,500	53,200	1.22	.....	
0	0	1.50	.....	

Elongation of inch sections, ".15, ".17, ".20, ".28, ".48\*, 22.

Fractured 2" from the neck. Appearance, fibrous.

Diameter at fracture, ".42. Area, .139 square inch.

Contraction of area, 44.6 per cent.

No. 4251.

Marks, 66.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0048	.....	
7,500	30,000	.0058	0.	
7,750	31,000	.0060	.....	
8,000	32,000	.0062	.....	
8,250	33,000	.0064	.....	
8,500	34,000	.0066	.....	
8,750	35,000	.0069	.....	
9,000	36,000	.0072	.....	Elastic limit. Load fell.
9,000	32,000	.0102	.....	
8,250	33,000	.0120	.....	
8,500	34,000	.0170	.....	
8,750	35,000	.0550	.....	
9,000	36,000	.0838	.....	
9,250	37,000	.1448	.....	
9,500	38,000	.1560	.....	
9,750	39,000	.1680	.....	
10,000	40,000	.1840	.....	
10,500	42,000	.2175	.....	
11,000	44,000	.2620	.....	
11,500	46,000	.31	.....	
12,000	48,000	.38	.....	
12,500	50,000	.46	.....	
13,000	52,000	.59	.....	
13,500	54,000	.82	.....	
13,720	54,880	1.20	.....	Tensile strength.
0	0	1.54	.....	= 25.7 per cent.

Elongation of inch sections, ".20, ".26, ".45\*, ".25, ".21, ".17.

Fractured 3".20 from the neck. Appearance, fibrous lamellar.

Diameter at fracture, ".44. Area, .1521 square inch.

Contraction of area, 39.2 per cent.

No. 4252.

Mark, 67.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	-----	
2,500	10,000	.0021	-----	
3,750	15,000	.0031	-----	
5,000	20,000	.0042	-----	
6,250	25,000	.0051	-----	
7,500	30,000	.0062	0.	
7,750	31,000	.0063	-----	
8,000	32,000	.0066	-----	
8,250	33,000	.0068	-----	
8,500	34,000	.0071	-----	Elastic limit. Load fell.
7,750	31,000	.0117	-----	
8,000	32,000	.0162	-----	
8,250	33,000	.0302	-----	
8,500	34,000	.0858	-----	
8,750	35,000	.1225	-----	
9,000	36,000	.1450	-----	
9,250	37,000	.1575	-----	
9,500	38,000	.1740	-----	
9,750	39,000	.1875	-----	
10,000	40,000	.2060	-----	
10,500	42,000	.25	-----	
11,000	44,000	.30	-----	
11,500	46,000	.36	-----	
12,000	48,000	.42	-----	
12,500	50,000	.52	-----	
13,000	52,000	.70	-----	
13,450	53,800	1.25	-----	Tensile strength.
0	0	1.57	-----	= 26.2 per cent.

Elongation of inch sections, ".25, ".25, ".25, ".44\*, ".21, ".17.

Fractured 3" from the neck. Appearance, fibrous lamellar.

Diameter at fracture, ".43. Area, .1452 square inch.

Contraction of area, 41.9 per cent.



No. 4253.

Mark, 68.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	.....	
2,500	10,000	.0019	.....	
3,750	15,000	.0029	.....	
5,000	20,000	.0039	.....	
6,250	25,000	.0049	.....	
7,500	30,000	.0060	0.	
8,000	32,000	.0065	.....	
8,250	33,000	.0067	.....	
7,250	29,000	.0205	.....	Elastic limit. Load fell.
7,500	30,000	.0368	.....	
7,750	31,000	.0490	.....	
8,000	32,000	.1125	.....	
8,500	34,000	.1502	.....	
9,000	36,000	.1820	.....	
9,500	38,000	.2170	.....	
10,000	40,000	.2652	.....	
10,500	42,000	.31	.....	
11,000	44,000	.38	.....	
11,500	46,000	.48	.....	Tensile strength. = 24.5 per cent.
12,000	48,000	.61	.....	
12,500	50,000	.82	.....	
12,830	51,320	1.19	.....	
0	0	1.47	.....	

Elongation of inch sections, ".17, ".18, ".20, ".20, ".34, ".38\*.

Fractured 1".4 from the neck. Appearance fibrous.

Diameter at fracture, ".37. Area, .1075 square inch.

Contraction of area, 57.0 per cent.

H. Ex. 165—69

No. 4254.

Marks, 78.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0021	.....	
3,750	15,000	.0032	.....	
5,000	20,000	.0042	.....	
6,250	25,000	.0052	.....	
7,500	30,000	.0063	.0002	
7,750	31,000	.0065	.....	
8,000	32,000	.0067	.....	
8,250	33,000	.0069	.....	
8,500	34,000	.0071	.....	
8,750	35,000	.0074	.....	
9,000	36,000	.0076	.....	
9,250	37,000	.0078	.....	Elastic limit. Load fell.
8,000	32,000	.0155	.....	
8,250	33,000	.0280	.....	
8,500	34,000	.0655	.....	
8,750	35,000	.1050	.....	
9,000	36,000	.2148	.....	
9,250	37,000	.2213	.....	
9,500	38,000	.2368	.....	
9,750	39,000	.2650	.....	
10,000	40,000	.2955	.....	
10,500	42,000	.39	.....	
11,000	44,000	.47	.....	
11,500	46,000	.61	.....	
12,000	48,000	.80	.....	
12,370	49,480	1.47	.....	Tensile strength.
0	0	1.82	.....	=30.3 per cent.

Elongation of inch sections, ".21, ".30, ".34, ".51\*, ".26, ".20.

Fractured 3".5 from the neck. Appearance fibrous.

Diameter at fracture, ".40. Area, .1257 square inch.

Contraction of area, 49.7 per cent.

No. 4255.

Mark, 79.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0010	.....	
2,500	10,000	.0020	.....	
3,750	15,000	.0030	.....	
5,000	20,000	.0041	.....	
6,250	25,000	.0051	.....	
7,500	30,000	.0061	0.	
8,000	32,000	.0066	.....	
8,250	33,000	.0068	.....	
8,500	34,000	.0070	.....	
8,750	35,000	.0072	.....	
9,000	36,000	.0074	.....	
9,250	37,000	.0077	.....	
9,500	38,000	.0079	.....	Elastic limit. Load fell.
9,000	32,000	.0150	.....	
8,250	33,000	.0178	.....	
8,500	34,000	.0295	.....	
8,750	35,000	.0438	.....	
9,000	36,000	.0868	.....	
9,250	37,000	.2268	.....	
9,500	38,000	.2350	.....	
9,750	39,000	.2465	.....	
10,000	40,000	.29	.....	
10,500	42,000	.36	.....	
11,000	44,000	.44	.....	
11,500	46,000	.57	.....	
12,000	48,000	.74	.....	
12,500	50,000	1.33	.....	Tensile strength.
0	0	1.61	.....	=26.8 per cent.

Elongation of inch sections, ".19, ".22, ".22, ".22, ".28, ".48\*.

Fractured 1".1 from neck. Appearance, fibrous.

Diameter at fracture, ".38. Area, .1134 square inch.

Contraction of area, 54.6 per cent.

No. 4256.

Mark, 80.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0037	.....	
6,250	25,000	.0046	.....	
7,500	30,000	.0058	0.	
8,000	32,000	.0061	.....	
8,250	33,000	.0064	.....	
8,500	34,000	.0065	.....	
8,750	35,000	.0067	.....	
9,000	36,000	.0070	.....	Elastic limit. Load fell.
7,750	31,000	.0208	.....	
8,000	32,000	.0240	.....	
8,250	33,000	.0280	.....	
8,500	34,000	.0346	.....	
8,750	35,000	.0520	.....	
9,000	36,000	.2120	.....	
9,250	37,000	.2205	.....	
9,500	38,000	.2370	.....	
9,750	39,000	.2550	.....	
10,000	40,000	.2980	.....	
10,500	42,000	.38	.....	
11,000	44,000	.47	.....	
11,500	46,000	.58	.....	
12,000	48,000	.77	.....	
12,360	49,440	1.22	.....	Tensile strength.
0	0	1.70	.....	=28.3 per cent.

Elongation of inch sections, ".17, ".22, ".25, ".29, ".51\*, ".25.

Fractured 2".25 from the neck. Appearance, fibrous.

Diameter at fracture, ".39. Area, .1194 square inch.

Contraction of area, 52.2 per cent.

No. 4257.

Mark, 81.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch</i>	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	.....	
2,500	10,000	.0018	.....	
3,750	15,000	.0028	.....	
5,000	20,000	.0038	.....	
6,250	25,000	.0049	.....	
7,000	30,000	.0060	0.	
8,000	32,000	.0064	.....	
8,250	33,000	.0067	.....	
8,500	34,000	.0069	.....	
8,750	35,000	.0070	.....	
9,000	36,000	.0072	.....	
9,250	37,000	.0075	.....	Elastic limit. Load fell.
8,000	32,000	.0160	.....	
8,250	33,000	.0230	.....	
8,500	34,000	.0395	.....	
8,750	35,000	.0765	.....	
9,000	36,000	.1440	.....	
9,250	37,000	.2290	.....	
9,500	38,000	.2440	.....	
9,750	39,000	.2690	.....	
10,000	40,000	.3050	.....	
10,500	42,000	.40	.....	
11,000	44,000	.50	.....	
11,500	46,000	.62	.....	
12,000	48,000	.94	.....	
12,180	48,720	.....	.....	Tensile strength.
0	0	1.44	.....	= 24.0 per cent.

Elongation of inch sections, ".15, ".18, ".19, ".22, ".32, ".38\*.

Fractured 1".25 from the neck. Appearance, fibrous, lamellar.

Diameter at fracture, ".40. Area, .1257 square inch.

Contraction of area, 49.7 per cent.

No. 4258.

Mark, 82.

Diameter, ".564.

Sectional area, .25 square inch.

Gauged length, 6".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	Pounds.	Inches.	Inch.	
0	0	0.	0.	Initial load.
1,250	1,000	0.0008	.....	
2,500	5,000	0.0018	.....	
3,750	10,000	0.0027	.....	
5,000	15,000	0.0037	.....	
6,250	20,000	0.0048	.....	
7,500	25,000	0.0058	— .0001	
8,000	30,000	0.0062	.....	
8,250	32,000	0.0065	.....	
8,500	33,000	0.0067	.....	
8,750	34,000	0.0069	.....	
9,000	35,000	0.0071	.....	
9,250	36,000	0.0073	.....	
9,500	37,000	0.0076	.....	Elastic limit. Load fell.
7,750	38,000	0.0165	.....	
8,000	31,000	0.0195	.....	
8,250	32,000	0.0375	.....	
8,500	33,000	0.0650	.....	
8,750	34,000	0.1850	.....	
9,000	35,000	0.1955	.....	
9,250	36,000	0.2060	.....	
9,500	37,000	0.2412	.....	
9,750	38,000	0.2550	.....	
10,000	39,000	0.2960	.....	
10,500	40,000	0.38	.....	
11,000	42,000	0.44	.....	
11,500	44,000	0.53	.....	
12,000	46,000	0.80	.....	
12,310	48,000	1.80	.....	Tensile strength.
0	49,240	1.64	.....	= 27.3 per cent.

Elongation of inch sections, ".20, ".24, ".47\*, ".29, ".24, ".20.

Fractured 3".4 from the neck. Appearance, fibrous.

Diameter at fracture, ".41. Area, .132 square inch.

Contraction of area, 47.2 per cent.

TABULATION OF TENSILE SPECIMENS FROM BARS RUPTURED BY ENDURANCE TESTS OF ROTATING SHAFTS.

Ten- sion- test num- ber.	Endur- ance-test number.	Mark on bar.	Material.	Diam- eter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation in 6 inches.	Con- trac- tion of area.	Appearance of fracture.	Elongation of inch sections.
				Inches.	Sq. inch.	Pounds.	Pounds.	Per cent.	Per cent.		" " " " " "
4230	31	1	O. H. steel.	.564	.25	63,520	63,520	26.7	67.8	Fine silky	.15, .20, .28, .56*, .24, .17
4231	32	1	do	.564	.25	51,000	62,920	26.7	67.8	do	.16, .21, .28, .57*, .22, .16
4232	33	1	do	.564	.25	53,000	62,800	26.2	69.8	do	.16, .20, .26, .56*, .22, .17
4233	34	1	do	.564	.25	52,000	62,320	26.7	69.8	do	.16, .24, .57*, .23, .21, .19
4234	50	2	do	.564	.25	48,000	62,080	29.2	65.8	do	.20, .25, .30, .56*, .24, .20
4235	51	2	do	.564	.25	47,000	62,080	30.0	67.8	do	.18, .25, .28, .59*, .26, .22
4236	55	3	do	.564	.25	48,000	63,580	29.8	65.8	do	.20, .26, .59*, .27, .25, .22
4237	70	4	do	.564	.25	45,000	60,080	30.5	67.8	do	.19, .24, .33, .59*, .26, .21
4238	71	4	do	.564	.25	47,000	60,960	29.7	69.8	do	.18, .23, .27, .61*, .26, .21
4239	72	4	do	.564	.25	45,000	60,480	29.3	69.8	do	.19, .23, .26, .62*, .26, .20
4240	73	4	do	.564	.25	47,000	61,240	28.8	69.8	do	.20, .27, .62*, .31, .23, .16
4241	74	5	do	.564	.25	51,000	61,640	26.7	67.8	do	.17, .20, .25, .57*, .24, .17
4242	75	5	do	.564	.25	50,000	62,000	28.5	69.8	do	.18, .24, .30, .57*, .23, .19
4243	76	5	do	.564	.25	49,000	61,040	27.8	69.8	do	.17, .23, .49*, .37, .23, .19
4244	77	5	do	.564	.25	55,000	62,080	26.8	67.8	do	.13, .20, .23, .56*, .28, .19
4245	41	1	Wrought iron.	.564	.25	36,000	48,080	27.3	47.2	Fibrous	.19, .43*, .32, .27, .22, .21
4246	42	1	do	.564	.25	34,000	47,840	25.0	49.7	do	.20, .45*, .23, .21, .20, .18
4247	43	1	do	.564	.25	33,000	47,560	27.0	47.2	do	.24, .52*, .25, .22, .21, .18
4248	44	1	do	.564	.25	34,000	47,280	24.2	52.2	do	.15, .20, .21, .26, .46*, .18
4249	45	2	do	.564	.25	38,000	54,920	25.7	44.9	Fibrous, lamellar.	.23, .45*, .28, .22, .19, .17
4250	46	2	do	.564	.25	38,000	54,000	23.5	41.9	do	.19, .23, .26, .36*, .20, .17
4251	48	2	do	.564	.25	37,000	54,960	24.0	36.4	do	.20, .36*, .24, .21, .19
4252	49	2	do	.564	.25	37,000	54,440	25.5	41.9	do	.20, .26, .45*, .28, .20, .19
4253	36	3	do	.564	.25	31,000	50,720	25.2	47.2	Fibrous	.45*, .25, .27, .24, .17, .13
4254	27	3	do	.564	.25	34,000	49,800	27.0	47.2	do	.22, .48*, .28, .26, .21, .18
4255	38	3	do	.564	.25	32,000	49,720	27.8	52.2	do	.19, .26, .47*, .24, .23, .23
4256	39	3	do	.564	.25	32,000	49,180	27.0	52.2	do	.20, .46*, .33, .24, .23, .21
4257	40	3	do	.564	.25	31,000	49,680	26.2	49.7	do	.16, .20, .20, .27, .48*, .20
4258	60	4	do	.564	.25	26,000	52,240	25.0	44.6	do	.15, .17, .30, .28, .48, .22
4259	65	5	do	.564	.25	28,000	53,300	25.7	39.2	Fibrous, lamellar.	.20, .26, .45*, .25, .21, .17
4260	66	5	do	.564	.25	26,000	53,860	26.2	41.9	do	.25, .18, .25, .44*, .21, .17
4261	67	5	do	.564	.25	34,000	53,800	24.5	57.0	Fibrous	.17, .18, .20, .34, .38*
4262	68	5	do	.564	.25	33,000	51,320	30.3	49.7	do	.21, .30, .54, .51*, .26, .20
4263	78	6	do	.564	.25	37,000	49,440	26.8	52.2	do	.19, .22, .52, .22, .23, .18*
4264	79	6	do	.564	.25	36,000	50,000	28.3	52.2	do	.17, .22, .25, .23, .51*, .26
4265	80	6	do	.564	.25	38,000	49,440	24.0	49.7	Fibrous, lamellar.	.15, .16, .19, .22, .24, .38*
4266	81	6	do	.564	.25	37,000	49,720	27.3	47.2	do	.20, .24, .47*, .29, .24, .20
4267	82	6	do	.564	.25	38,000	49,340	27.3	47.2	do	.15, .20, .23, .27, .22, .21





---

---

## NATURAL STONES AND BUILDING MATERIAL.

COEFFICIENT OF EXPANSION, COMPRESSION TESTS, AND TRANSVERSE  
TESTS.

---

---



The expansion of the stones was determined on a gauged length of about 20 inches.

The specimens were prepared with  $\frac{1}{4}$ -inch drilled holes, into which were driven brass plugs, and in the ends of the plugs were made small drilled and counter-sunk holes defining the extremities of the gauged length.

The stones were first measured in the open air, afterward in water baths of different temperature, the temperature of the cold bath being about 33.5° F.; that of the hot bath in the vicinity of 180° to 200° F.

The details of the tests show a very decided swelling of the stones in most cases after soaking for a time in water, which effect was generally increased by the hot over that of the cold water.

In order to eliminate the effect of this swelling and obtain coefficients of expansion for the wet material due principally or solely to change in temperature, the values of the coefficients as computed are from the contractions of the stones while returning from the temperature of the hot to the temperature of the cold bath.

The same specimens were used in compression tests, and when not fractured in this manner were ruptured finally by transverse stress.

The compression tests were undertaken chiefly to investigate the moduli of elasticity under different loads and the behavior of the material under ascending and descending stresses.

The moduli of elasticity have been computed between different stresses, deducting the permanent sets in each case, and these values are stated in the details of the tests.

## DETAILS OF COEFFICIENT OF EXPANSION EXPERIMENTS.

No. 5001.

HOOSIER BUFF, OOLITIC LIMESTONE, FROM BEDFORD, IND.

Dimensions, 24" × 6".03 × 4".

Original gauged length in air, 20".0033.

Temperature of room, 60° F.

Bath.		Gauged length.		Remarks.
Tempera- ture (de- grees, F.).	Time exposed.	Total	Successive difference.	
57	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	After soaking in bath 14 days. When placed in hot bath air escapes from stone. Cooled in air.
178	4½	20.0168	.0133	
33.5	20½	20.0059	.0109	

No. 5002.

## INDIANA LIMESTONE.

Dimensions,  $23''.98 \times 6''.03 \times 4''.06$ .Original gauged length in air,  $20''.0084$ .Temperature of room,  $68^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
33.5	$\frac{1}{4}$	20.0074	.0010	Air continues to escape from stone in steady stream.
33.5	1	20.0069	.0005	
33.5	2	20.0070	.0001	
33.5	3	20.0071	.0001	
33.5	19	20.0074	.0004	Do.
34	1	20.0074	0.	Removed from bath.
176	$5\frac{1}{2}$	20.0080	.0006.	In air 3 days. Temperature of room, $68^{\circ}$ F.
178.5	$2\frac{1}{2}$	20.0210	.0130	Returned to bath.
67	15	20.0205	.0005	
179	$6\frac{1}{2}$	20.0116	.0089	
177	$1\frac{1}{2}$	20.0221	.0105	
76	15	20.0223	.0002	
33.5	$\frac{1}{2}$	20.0132	.0091	
33.5	$4\frac{1}{2}$	20.0124	.0008	
33.5	6	20.0120	.0004	
34	6	20.0115	.0005	
50	$8\frac{1}{2}$	-----	-----	
		20.0118	.0003	

No. 5003.

## VERMONT MARBLE.

Dimensions,  $23''.94 \times 5''.99 \times 3''.98$ .Original gauged length in air,  $19''.9989$ .Temperature of room,  $71^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
33.5	$\frac{1}{2}$	19.9988	.0001	After soaking in bath 14 days.
33.5	4	19.9989	.0001	
33.5	24	19.9993	.0004	
33.5	$30\frac{1}{2}$	20.0000	.0007	
33.5	48	19.9994	.0006	
33.6	53	19.9995	.0001	
33.5	144	19.9990	.0005	
53	-----	20.0000	.0010	
203	7	20.0239	.0239	
71	16	20.0109	.0130	
194	5	20.0223	.0114	
54	18	20.0117	.0106	
34	26	20.0119	.0002	
34	$42\frac{1}{2}$	20.0118	.0001	

## No. 5004.

## LEE (MASS.) MARBLE.

Dimensions,  $23''.97 \times 6'' \times 3''.97$ .Original gauged length in air,  $20''.0061$ .Temperature of room,  $60^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees F.).	Time exposed.	Total.	Successive difference.	
54	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	After soaking in bath 7 days 4 hours.
189.5	----- 6	20.0060	.0001	
184	7 $\frac{1}{2}$	20.0236	.0176	
184	4 $\frac{1}{2}$	20.0217	.0019	
		20.0221	.0004	Cooled in air.
33.5	19 $\frac{1}{2}$	20.0061	.0160	

## No. 5005.

## POTOMAC RED SANDSTONE.

Dimensions,  $24''.01 \times 6''.01 \times 4''.02$ .Original gauged length in air,  $20''.0034$ .Temperature of room,  $72^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	Removed from bath. In air 2 days. Temperature of room, $68^{\circ}$ F. After soaking in bath 19 days.
33.5	$\frac{1}{8}$	20.0016	.0018	
33.5	1 $\frac{1}{8}$	20.0010	.0006	
33.5	17 $\frac{1}{2}$	20.0020	.0010	
33.5	18	20.0021	.0001	
		20.0045	.0024	
53.5	-----	20.0045	.0	
187	3 $\frac{1}{2}$	20.0182	.0137	
58.5	10	20.0050	.0132	
183	7 $\frac{1}{2}$	20.0187	.0137	
64.5	16	20.0061	.0126	
33.5	1	20.0035	.0026	
33.5	31 $\frac{1}{2}$	20.0036	.0001	

## No. 5006.

## PORTLAND RED SANDSTONE.

Dimensions, 24"  $\times$  5".97  $\times$  3".97.

Original gauged length in air, 19".9912.

Temperature of room, 74° F.

Bath.		Gauged length.		Remarks.
Tempera- ture (de- grees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
33.5	$\frac{1}{2}$	19.9906	.0006	
33.5	16	19.9936	.0030	
33.5	22	19.9936	0.	
33.5	24	19.9934	.0002	
33.5	40	19.9932	.0002	
33.5	46 $\frac{1}{2}$	19.9930	.0002	
33.5	48	19.9935	.0005	
33.5	64 $\frac{1}{2}$	19.9936	.0001	
180	4 $\frac{1}{2}$	20.0105	.0169	
182	1 $\frac{1}{2}$	20.0095	.0010	
55 to 58	-----	19.9969	.0126	After soaking in bath 6 $\frac{1}{2}$ days.
33.5	$\frac{1}{2}$	19.9968	.0001	
33.5	7	19.9954	.0014	
33.5	71	19.9951	.0003	

## No. 5007.

## OHIO SANDSTONE.

Dimensions, 23".96  $\times$  5".98  $\times$  3".97.

Original gauged length in air, 20".0019.

Temperature of room, 70° F.

Bath.		Gauged length.		Remarks.
Tempera- ture (de- grees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
63	-----	20.0037	.0018	After soaking in bath 12 days 4 hours. When placed in hot bath, pieces flaked off corners near middle of length, where hand- screw used in handling was clamped. Air escapes from pores.
183	2 $\frac{1}{2}$	20.0187	.0150	
33.5	26 $\frac{1}{2}$	20.0001	.0186	
33.5	71 $\frac{1}{2}$	20.0005	.0004	Cooled in air.

No. 5008.

## MONSON (ME.) SLATE.

Dimensions,  $24''.07 \times 6''.13 \times 4''.10$ .Original gauged length in air,  $19''.9954$ .Temperature of room,  $68^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
33.5	$-\frac{1}{2}$	19.9949	.0005	
33.5	$-\frac{1}{3}$	19.9940	.0009	
33.5	2	19.9934	.0006	
33.5	$4\frac{1}{2}$	19.9933	.0001	
33.5	6	19.9928	.0005	
33.5	7	19.9935	.0007	
33.5	$22\frac{1}{2}$	19.9934	.0001	
61	-----	19.9971	.0037	Removed from bath.
195	8	19.9965	.0006	In air 12 hours. Temperature of room, $68^{\circ}$ F.
68.5	16	20.0096	.0131	After soaking in bath 17 days.
191	$6\frac{1}{2}$	19.9977	.0118	
34	$41\frac{1}{2}$	20.0108	.0131	
34	65	19.9951	.0157	
34		19.9950	.0001	

No. 5009.

## NORTH RIVER BLUE STONE.

Dimensions,  $23''.98 \times 6''. \times 4''$ .Original gauged length in air,  $20''.0052$ .Temperature of room,  $67^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature, degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
33.5	$\frac{1}{2}$	20.0026	.0026	
33.5	$1\frac{1}{2}$	20.0018	.0008	
33.5	5	20.0019	.0001	
		20.0059	.0040	
59	-----	20.0146	.0087	Removed from bath.
192	7	20.0340	.0196	In air $2\frac{1}{2}$ days. Temperature of room, $68^{\circ}$ F.
61.5	17	20.0182	.0158	After soaking in bath 21 days.
34	$\frac{1}{2}$	20.0155	.0027	
34	$5\frac{1}{2}$	20.0151	.0003	
34	$76\frac{1}{2}$	20.0156	.0004	

No. 5010.

## WORCESTER GRANITE.

Dimensions,  $24''.02 \times 6''.01 \times 4''.01$ .Original gauged length in air,  $20''.0023$ .Temperature of room,  $74^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Tempera- ture (de- grees, F.).	Time * exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
33.5	$\frac{1}{2}$	20.0015	.0008	
33.5	4	20.0010	.0005	
33.5	7	20.0011	.0001	
33.5	23	20.0015	.0004	
33.5	31	20.0014	.0001	
33.5	50	20.0018	.0004	
49	83	20.0009	.0009	After soaking in bath 3 days 21 hours.
33.5	■	20.0017	.0008	
55.5	-----	20.0029	.0012	After soaking in bath 10 days.
182.5	7	20.0163	.0134	
45	16	20.0043	.0120	
183	$2\frac{1}{2}$	20.0166	.0123	
60.5	22	20.0059	.0107	
33.5	$\frac{1}{2}$	20.0046	.0013	
33.5	$30\frac{1}{2}$	20.0044	.0002	
33.5	$46\frac{1}{2}$	20.0049	.0005	

No. 5011.

## QUINCY GRANITE.

Dimensions,  $24'' \times 6'' \times 4''$ .Original gauged length in air,  $19''.9951$ .Temperature of room,  $72^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Tempera- ture (de- grees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	
53	-----	19.9952	.0001	
199	$5\frac{1}{2}$	20.0079	.0127	After soaking in bath 10 days.
179	6	20.0062	.0017	
33.5	24	19.9953	.0109	
33.5	$49\frac{1}{2}$	19.9957	.0004	
33.5	$65\frac{1}{2}$	19.9957	0.	



## No. 5012.

## CAPE ANN GRANITE.

Dimensions,  $24'' \times 6''.02 \times 4''.01$ .  
 Original gauged length in air,  $19''.9303$ .  
 Temperature of room,  $58^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	After soaking in bath 11 days.
66	-----	19.9315	.0012	
179	7½	19.9395	.0080	
181	4	19.9401	.0006	
33.5	23½	19.9310	.0091	

## No. 5013.

## RED BRICK No. 1.

Dimensions,  $7''.84 \times 3''.53 \times 2''.18$ .  
 Weight, 4 pounds  $11\frac{1}{4}$  ounces.  
 Original gauged length in air,  $6''.0852$ .  
 Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	Removed from hot bath. Weight, 4 pounds 15 ounces.
52	42½	6.0850	.0002	
184	3½	6.0874	.0024	
34	186	6.0842	.0032	

## No. 5014.

## RED BRICK No. 2.

Dimensions,  $7''.85 \times 3''.61 \times 2''.23$ .  
 Weight, 4 pounds  $12\frac{1}{4}$  ounces.  
 Original gauged length in air,  $6''.0109$ .  
 Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
	<i>Hours.</i>	<i>Inches.</i>	<i>Inch.</i>	Removed from hot bath. Weight, 5 pounds $1\frac{1}{4}$ ounces.
52	42½	6.0107	.0002	
184	3½	6.0129	.0022	
34	186	6.0106	.0023	

No. 5015.

RED BRICK No. 3.

Dimensions,  $7''.70 \times 3''.58 \times 2''.21$ .Weight, 4 pounds  $10\frac{1}{2}$  ounces.Original gauged length in air,  $5''.9396$ .Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
52	<i>Hours.</i> 42 $\frac{1}{4}$	<i>Inches.</i> 5.9391	<i>Inch.</i> .0005	Removed from hot bath. Weight, 4 pounds $14\frac{1}{2}$ ounces.
184	4	5.9417	.0026	
34	186	5.9394	.0023	

No. 5016.

RED BRICK No. 4.

Dimensions,  $7''.78 \times 3''.58 \times 2''.22$ .Weight, 4 pounds  $12\frac{1}{4}$  ounces.Original gauged length in air,  $6''.0204$ .Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
52	<i>Hours.</i> 42 $\frac{1}{4}$	<i>Inches.</i> 6.0200	<i>Inch.</i> .0004	Removed from hot bath. Weight, 5 pounds $\frac{1}{2}$ ounce.
184	4	6.0224	.0024	
34	186	6.0195	.0029	

No. 5017.

FIRE BRICK No. 1.

Dimensions,  $9''.21 \times 4''.52 \times 2''.58$ .Weight, 6 pounds  $15\frac{1}{4}$  ounces.Original gauged length in air,  $5''.9968$ .Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
52	<i>Hours.</i> 42 $\frac{1}{4}$	<i>Inches.</i> 5.9967	<i>Inch.</i> .0001	Removed from hot bath. Weight, 7 pounds $14\frac{3}{4}$ ounces. Placed in cold bath.
184	4	5.9994	.0024	
34	186	5.9968	.0026	

No. 5018.

## FIRE BRICK No. 2.

Dimensions,  $9''.26 \times 4''.55 \times 2''.53$ .Weight, 6 pounds  $13\frac{3}{4}$  ounces.Original gauged length in air,  $5''.9988$ .Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
52	Hours. $42\frac{1}{2}$	Inches. 5.9984	Inch. .0004	Removed from hot bath. Weight, 7 pounds $13\frac{3}{4}$ ounces. Placed in cold bath.
184	$4\frac{1}{2}$	6.0010	.0026	
34	186	5.9988	.0022	

No. 5019.

## HOLLOW FIRE PROOF BUILDING BLOCK, FROM ST. PAUL, MINN.

Weight, 10 pounds  $12\frac{1}{2}$  ounces.Dimensions,  $12'' \times 6'' \times 4''$ .Hollow core,  $1\frac{5}{8}'' \times 3\frac{5}{8}''$ .Original gauged length in air,  $10''.0036$ .Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
185	Hours. $4\frac{1}{2}$	Inches. 10.0076	Inch. .0040	Weight, 12 pounds 13 ounces.
60	164	-----	-----	
34	$53\frac{1}{2}$	10.0032	.0044	

No. 5020.

ASHLER BRICK, MARKED E<sub>1</sub>, FROM FISKE, COLEMAN & Co., BOSTON, MASS.Dimensions,  $12'' \times 3'' \times 4''$ .Weight, 8 pounds  $13\frac{3}{4}$  ounces.Original gauged length in air,  $10''.0218$ .Temperature of room,  $75^{\circ}$  F.

Bath.		Gauged length.		Remarks.
Temperature (degrees, F.).	Time exposed.	Total.	Successive difference.	
185	Hours. $4\frac{1}{2}$	Inches. 10.0245	Inch. .0027	Weight, 9 pounds $9\frac{1}{4}$ ounces.
60	164	-----	-----	
34	$53\frac{1}{2}$	10.0217	.0028	

TABULATION OF COEFFICIENTS OF EXPANSION OF STONES, AS DETERMINED IN WATER BATHS.

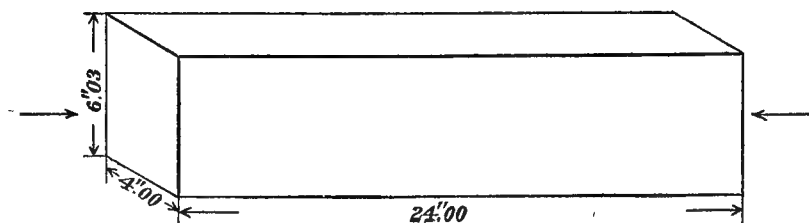
Description of stones.			Temperature of baths, F.			Gauged lengths.			Coefficient of expansion.
Name.	Quarry.	Location.	Original gauged length in air.	Hot.	Cold.	Difference.	Hot.	Cold.	
Hoosier Buff Oolitic limestone.		Indiana.	Inches.	°	°	°	Inches.	Inches.	
Limestone.		do.	20.0033	178	33.5	144.5	20.0168	20.0059	.00000375
Marble.		do.	20.0084	177	33.5	143.5	20.0223	20.0115	.0109
Marble.		Vermont.	19.9989	203	34	169	20.0239	20.0117	.0108
Marble.		Massachusetts.	20.0061	180.5	33.5	156	20.0236	20.0061	.0122
Red sandstone.	Potomac Red Sandstone Co.	Maryland.	20.0034	183	33.5	149.5	20.0187	20.0035	.00000562
Red sandstone.	Brainerd Quarry Co., Portland	Connecticut.	19.9912	180	33.5	146.5	20.0105	19.9951	.00000501
Sandstone.		Ohio.	20.0019	183	33.5	149.5	20.0187	20.0001	.00000522
Slate.	Monson.	Maine.	19.9954	194	34	160	20.0108	19.9950	.00000622
Bluestone.		New York.	20.0052	192	33.5	158.5	20.0340	20.0151	.00000500
Granite.	Worcester Quarry, Milford.	Massachusetts.	20.0023	183	33.5	149.5	20.0166	20.0044	.00000408
Granite*.	Quincy.	do.	19.9951	199	33.5	165.5	20.0079	19.9953	.00000381
Granite.	Rockport Granite Co., Cape Ann.	do.	19.9303	181	33.5	147.5	19.9401	19.9310	.00000311
Red brick, No. 1.	Manufactured.		6.0852	184	34	150	6.0874	6.0842	.00000351
Red brick, No. 2.	do.		6.0109	184	34	150	6.0129	6.0106	.00000255
Red brick, No. 3.	do.		5.9396	184	34	150	5.9417	5.9394	.00000258
Red brick, No. 4.	do.		6.0204	184	34	150	6.0224	6.0195	.00000321
Fire brick, No. 1.	do.		5.9968	184	34	150	5.9994	5.9968	.00000289
Fire brick, No. 2.	do.		5.9988	184	34	150	6.0010	5.9988	.00000244
Ashlar brick E.	do.		10.0218	185	34	151	10.0245	10.0217	.00000185
Hollow fireproof building brick.	do.		10.0036	185	34	151	10.0076	10.0032	.00000291

\* Quarried about the year 1840. Specimens taken from the old post-office building, State street, Boston, Mass.

No. 5001a.

## HOOSIER BUFF OOLITIC (INDIANA) LIMESTONE.

## COMPRESSION TEST.



Sectional area, 24.12 square inches.

Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inches.</i>	<i>Inch.</i>	
2,412	100	0.	0.	Initial load.
4,824	200	.0003	.....	} E=3,600,000.
9,648	400	.0010	.....	
14,472	600	.0023	.....	
19,296	800	.0037	.....	
24,120	1,000	.0050	0.	} E=3,125,000.
33,768	1,400	.0078	.....	
43,416	1,800	.0105	.....	
53,064	2,200	.0134	.....	
62,712	2,600	.0164	.....	}
72,360	3,000	.0195	.....	
82,008	3,400	.0230	.....	
91,656	3,800	.0276	.....	
99,100	4,109	.....	.....	Ultimate strength.

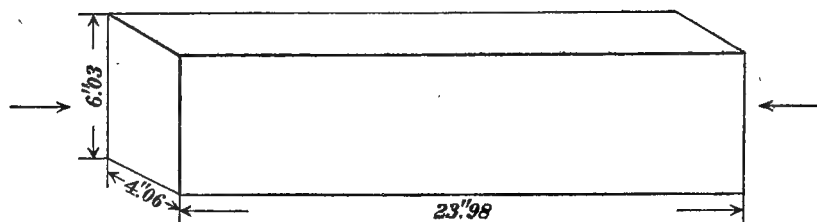
Opened oblique longitudinal fractures, leaving a wedged-shaped fragment at each end of the stone.

Rapid yielding gave warning of impending fracture one-half minute preceding final rupture.

No. 5002a.

## INDIANA LIMESTONE.

## COMPRESSION TEST.



Sectional area, 24.48 square inches.

Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,448	100	0.	0.	Initial load.  E = 5,225,200.
4,896	200	.0003	.....	
9,792	400	.0013	.....	
14,688	600	.0023	.....	
19,584	800	.0031	.....	
24,480	1,000	.0040	.0002	
34,272	1,400	.0053	.....	
44,064	1,800	.0069	.....	
53,856	2,200	.0082	.....	
63,648	2,600	.0096	.....	
73,440	3,000	.0110	.0001	Ultimate strength.
83,232	3,400	.0123	.....	
93,024	3,800	.0142	.....	
102,816	4,200	.0158	.....	
112,608	4,600	.0178	.....	
122,400	5,000	.0199	.....	

Sustained maximum load  $\frac{1}{2}$  minute, then failed, separating into wedge-shaped fragments.

No. 5003a.

## VERMONT MARBLE.

## COMPRESSION TEST.

Length, 23''.94.

Sectional area, 5''.99  $\times$  3''.98 = 23.84 square inches.

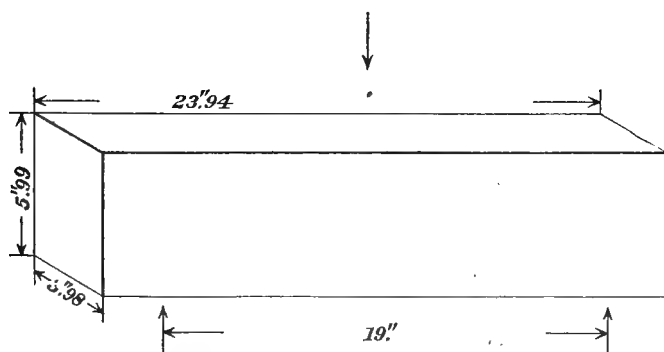
Gauged length, 20''.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,384	100	0.	0.	Initial load.
4,768	200	.0005	.....	
9,536	400	.0016	.....	
14,304	600	.0030	.....	
19,072	800	.0045	.....	
23,840	1,000	.0067	.0011	
33,376	1,400	.0078	.....	
42,912	1,800	.0095	.....	
52,448	2,200	.0109	.....	E=6,557,000.
61,984	2,600	.0122	.....	
71,520	3,000	.0135	.0028	
81,056	3,400	.0146	.....	
90,592	3,800	.0157	.....	
100,128	4,200	.0167	.....	E=9,302,000.
109,664	4,600	.0180	.....	
119,200	5,000	.0190	.0040	
128,736	5,400	.0201	.....	
138,272	5,800	.0211	.....	E=8,333,000.
147,808	6,200	.0222	.....	
157,344	6,600	.0235	.....	
166,880	7,000	.0247	.....	
119,200	5,000	.0208	.....	
71,520	3,000	.0163	.....	
23,840	1,000	.0106	.0049	
23,840	1,000	.0087	.....	
71,520	3,000	.0150	.....	
119,200	5,000	.0200	.....	E=7,018,000.
166,880	7,000	.0249	.....	
176,416	7,400	.0260	.....	
185,952	7,800	.0274	.....	
195,488	8,200	.0288	.....	
205,024	8,600	.0305	.....	
214,560	9,000	.0323	.....	
166,880	7,000	.0285	.....	
119,200	5,000	.0243	.....	
71,520	3,000	.0195	.....	
23,840	1,000	.0132	.0068	
23,840	1,000	.0110	.....	
71,520	3,000	.0176	.....	
119,200	5,000	.0228	.....	
166,880	7,000	.0276	.....	
119,200	5,000	.0236	.....	
71,520	3,000	.0190	.....	
23,840	1,000	.0130	.0070	Test discontinued.

No. 5003b.

VERMONT MARBLE.

TRANSVERSE TEST.



Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	-----	0.	0.	0.	Initial load.
1,000	-----	.0007	.0007	-----	
1,500	-----	.0017	.0010	-----	
2,000	-----	.0029	.0012	-----	
2,500	-----	.0040	.0011	.0016	
3,000	-----	.0050	.0010	-----	
3,500	-----	.0060	.0010	-----	
4,000	-----	.0070	.0010	-----	Ultimate strength.
4,500	-----	.0083	.0013	-----	
5,000	998	.0096	.0013	.0035	

Five thousand pounds total load was applied and released. The second application of this load caused rupture of the stone.



No. 5004a.

LEE MARBLE.

COMPRESSION TEST.

Length, 23'' .97.

Sectional area, 6''  $\times$  3'' .97 = 23.82 square inches.

Gauged length, 20''.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,382	100	0.	0.	Initial load.
4,764	200	.0006	.....	
9,528	400	.0019	.....	
14,292	600	.0030	.....	
19,056	800	.0041	.....	
23,820	1,000	.0051	.0011	
28,584	1,200	.0059	.....	
33,348	1,400	.0067	.....	E = 6,667,000.
38,112	1,600	.0074	.....	
42,876	1,800	.0080	.....	
47,640	2,000	.0085	.0015	
57,168	2,400	.0094	.....	
66,696	2,800	.0103	.....	E = 10,256,000.
76,224	3,200	.0112	.....	
85,752	3,600	.0119	.....	
95,280	4,000	.0126	.0017	
104,808	4,400	.0132	.....	
114,336	4,800	.0140	.....	E = 11,765,000.
123,864	5,200	.0146	.....	
133,392	5,600	.0153	.....	
142,920	6,000	.0161	.....	
95,280	4,000	.0129	.....	
47,640	2,000	.0090	.....	
23,820	1,000	.0063	.0018	
23,820	1,000	.0050	.....	
47,640	2,000	.0080	.....	
95,280	4,000	.0124	.....	E = 11,429,000.
142,920	6,000	.0159	.....	
152,448	6,400	.0164	.....	
161,976	6,800	.0173	.....	
171,504	7,200	.0179	.....	
181,032	7,600	.0185	.....	
190,560	8,000	.0192	.0014	
200,088	8,400	.0197	.....	
209,616	8,800	.0202	.....	E = 11,765,000.
219,144	9,200	.0207	.....	
228,672	9,600	.0216	.....	
238,200	10,000	.0224	.....	
190,560	8,000	.0194	.....	
142,920	6,000	.0161	.....	
95,280	4,000	.0127	.....	
47,640	2,000	.0087	.....	
23,820	1,000	.0058	.0012	
23,820	1,000	.0046	.....	
47,640	2,000	.0076	.....	
95,280	4,000	.0119	.....	
142,920	6,000	.0155	.....	
190,560	8,000	.0189	.....	
238,200	10,000	.0221	.....	
190,560	8,000	.0191	.....	
142,920	6,000	.0159	.....	E = 12,903,000.
95,280	4,000	.0125	.....	
47,640	2,000	.0085	.....	
23,820	1,000	.0058	.0013	
142,920	6,000	.0154	.....	Load left on stone over night.
114,300	4,798	.....	.....	Load on stone in the morning after 15 hours' rest.
114,336	4,800	.0134	.0009	
142,920	6,000	.0152	.....	
190,560	8,000	.0186	.....	
238,200	10,000	.0219	.....	
247,728	10,400	.0225	.....	
257,256	10,800	.0231	.....	
266,784	11,200	.0238	.....	
276,312	11,600	.0245	.....	
285,840	12,000	.0252	.....	

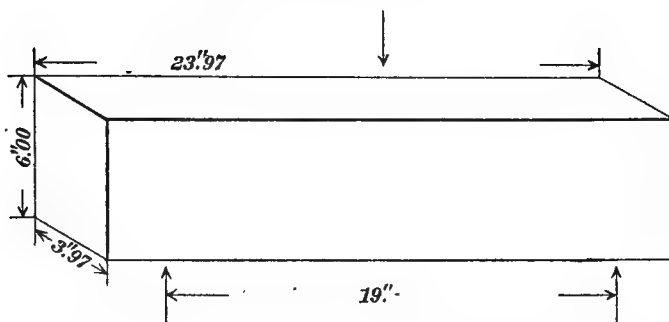
## No. 5004a—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
295,368	12,400	.0259	.....	E=12,500,000.
304,896	12,800	.0264	.....	
314,424	13,200	.0272	.....	
323,952	13,600	.0279	.....	
333,480	14,000	.0285	.....	
238,200	10,000	.0227	.....	
142,920	6,000	.0162	.....	
47,640	2,000	.0085	.....	
23,820	1,000	.0057	.0011	
23,820	1,000	.0044	.....	
47,640	2,000	.0074	.....	
142,920	6,000	.0155	.....	
238,200	10,000	.0223	.....	
142,920	6,000	.0160	.....	
238,200	10,000	.0224	.....	E=11,765,000.
333,480	14,000	.0286	.....	
343,008	14,400	.0292	.....	
352,536	14,800	.0300	.....	
362,064	15,200	.0308	.....	
371,592	15,600	.0316	.....	
381,120	16,000	.0324	.....	
333,480	14,000	.0294	.....	
238,200	10,000	.0234	.....	
142,920	6,000	.0169	.....	
47,640	2,000	.0089	.....	
23,820	1,000	.0061	.0015	
23,820	1,000	.0049	.....	
47,640	2,000	.0079	.....	
142,920	6,000	.0161	.....	Test discontinued.
23,820	1,000	.0229	.....	
333,480	14,000	.0291	.0015	

No. 5004*b*.

LEE MARBLE.

TRANSVERSE TEST.



Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	.....	0.	0.	0.	Initial load.
1,000	.....	.0006	.0006	.....	
1,500	.....	.0015	.0009	.....	
2,000	.....	.0022	.0007	.....	
2,500	.....	.0032	.0010	.0010	
3,000	.....	.0037	.0005	.....	
3,500	.....	.0046	.0009	.....	
4,000	.....	.0053	.0007	.....	
4,500	.....	.0059	.0006	.....	
5,000	.....	.0067	.0008	.0019	
5,500	.....	.0076	.0009	.....	
6,000	.....	.0082	.0006	.....	
6,500	.....	.0090	.0008	.....	
7,000	.....	.0097	.0007	.....	
7,500	.....	.0107	.0010	.0031	Ultimate strength.
7,940	1,584	.....	.....	.....	

No. 5005a.

## POTOMAC RED SANDSTONE.

## COMPRESSION TEST.

Length, 24".01.

Sectional area, 6".01  $\times$  4".02 = 24.16 square inches.

Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2, 416	100	0.	0.	Initial load.
4, 832	200	.0005	.....	
9, 664	400	.0015	.....	
14, 496	600	.0030	.....	
19, 328	800	.0045	.....	
24, 160	1, 000	.0060	.0010	
33, 824	1, 400	.0090	.....	
43, 488	1, 800	.0115	.....	E = 3, 883, 000.
53, 152	2, 200	.0138	.....	
62, 816	2, 600	.0160	.....	
72, 480	3, 000	.0182	.0029	E = 4, 706, 000.
82, 144	3, 400	.0202	.....	
91, 808	3, 800	.0220	.....	
101, 472	4, 200	.0240	.....	E = 5, 000, 000.
111, 136	4, 600	.0258	.....	
120, 800	5, 000	.0277	.0039	
130, 464	5, 400	.0295	.....	E = 5, 195, 000.
140, 128	5, 800	.0312	.....	
149, 792	6, 200	.0330	.....	
159, 456	6, 600	.0346	.....	E = 5, 263, 000.
169, 120	7, 000	.0365	.....	
120, 800	5, 000	.0295	.....	
72, 480	3, 000	.0217	.....	E = 5, 000, 000.
24, 160	1, 000	.0116	.0047	
24, 160	1, 000	.0095	.....	
72, 480	3, 000	.0197	.....	E = 5, 000, 000.
120, 800	5, 000	.0283	.....	
169, 120	7, 000	.0364	.....	
178, 784	7, 400	.0380	.....	E = 5, 000, 000.
188, 448	7, 800	.0396	.....	
198, 112	8, 200	.0412	.....	
207, 776	8, 600	.0430	.....	E = 5, 000, 000.
217, 440	9, 000	.0448	.....	
169, 120	7, 000	.0380	.....	
120, 800	5, 000	.0308	.....	E = 5, 000, 000.
72, 480	3, 000	.0227	.....	
24, 160	1, 000	.0125	.0053	
24, 160	1, 000	.0099	.....	E = 5, 000, 000.
72, 480	3, 000	.0202	.....	
120, 800	5, 000	.0289	.....	
169, 120	7, 000	.0370	.....	E = 5, 000, 000.
217, 440	9, 000	.0449	.....	
227, 104	9, 400	.0465	.....	
236, 768	9, 800	.0482	.....	E = 5, 000, 000.
246, 432	10, 200	.0499	.....	
256, 096	10, 600	.0515	.....	
265, 760	11, 000	.0531	.....	E = 5, 000, 000.
217, 440	9, 000	.0467	.....	
169, 120	7, 000	.0398	.....	
120, 800	5, 000	.0314	.....	E = 5, 000, 000.
72, 480	3, 000	.0239	.....	
24, 160	1, 000	.0143	.0060	
24, 160	1, 000	.0105	.....	E = 5, 000, 000.
72, 480	3, 000	.0210	.....	
120, 800	5, 000	.0297	.....	
169, 120	7, 000	.0368	.....	E = 5, 000, 000.
217, 440	9, 000	.0457	.....	
265, 760	11, 000	.0535	.....	
217, 440	9, 000	.0472	.....	E = 5, 000, 000.
169, 120	7, 000	.0402	.....	
150, 000	6, 210	.....	.....	
149, 792	6, 200	.0360	.....	Load left on stone Saturday night. Load found on stone Monday morning, after 40 hours' rest.
120, 800	5, 000	.0325	.....	

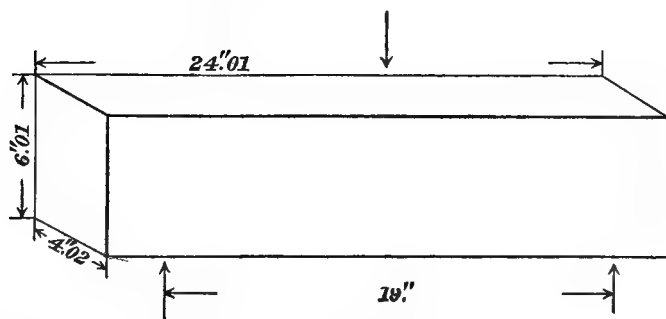
## No. 5005a—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
72,480	3,000	.0241	.....	
24,160	1,000	.0136	.0063	
265,760	11,000	.0536	.....	
275,424	11,400	.0550	.....	
285,088	11,800	.0566	.....	
294,752	12,200	.0582	.....	
304,416	12,600	.0600	.....	
314,080	13,000	.0619	.....	
265,760	11,000	.0555	.....	
217,440	9,000	.0489	.....	
169,120	7,000	.0415	.....	
120,800	5,000	.0337	.....	
72,480	3,000	.0249	.....	
24,160	1,000	.0142	.0068	
24,160	1,000	.0114	.....	
72,480	3,000	.0219	.....	
120,800	5,000	.0307	.....	
169,120	7,000	.0389	.....	
217,440	9,000	.0468	.....	
265,760	11,000	.0545	.....	
314,080	13,000	.0623	.....	
265,760	11,000	.0560	.....	
217,440	9,000	.0492	.....	
169,120	7,000	.0419	.....	
120,800	5,000	.0340	.....	
72,480	3,000	.0252	.....	
24,160	1,000	.0143	.0070	
24,160	1,000	.0117	.....	
72,480	3,000	.0232	.....	
120,800	5,000	.0312	.....	
169,120	7,000	.0392	.....	
120,800	5,000	.0322	.....	
72,480	3,000	.0243	.....	
24,160	1,000	.0141	.0070	
24,160	1,000	.0118	.....	
72,480	3,000	.0223	.....	
120,800	5,000	.0311	.....	
169,120	7,000	.0394	.....	
217,440	9,000	.0472	.....	
265,760	11,000	.0550	.....	
217,440	9,000	.0485	.....	
169,120	7,000	.0413	.....	
217,440	9,000	.0482	.....	
265,760	11,000	.0549	.....	
217,440	9,000	.0485	.....	
169,120	7,000	.0415	.....	
217,440	9,000	.0482	.....	
265,760	11,000	.0550	.....	
217,440	9,000	.0485	.....	
169,120	7,000	.0415	.....	
120,800	5,000	.0340	.....	
72,480	3,000	.0253	.....	
24,160	1,000	.0145	.0071	Test discontinued.

No. 5005*b*.

## POTOMAC RED SANDSTONE.

## TRANSVERSE TEST.

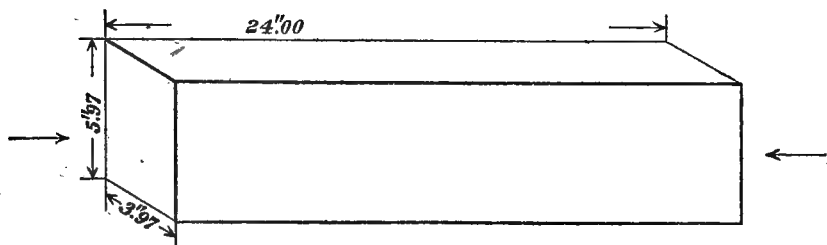


Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	.....	0.	0.	0.	Initial load.
1,000	.....	.0005	.0005	.....	
1,500	.....	.0011	.0006	.....	
2,000	.....	.0018	.0007	.....	
2,500	.....	.0026	.0008	.0007	
3,000	.....	.0034	.0008	.....	
3,500	.....	.0042	.0008	.....	
4,000	.....	.0050	.0008	.....	
4,500	.....	.0058	.0008	.....	
5,000	.....	.0067	.0009	.0021	
5,500	.....	.0076	.0009	.....	
6,000	.....	.0084	.0008	.....	
6,500	.....	.0091	.0007	.....	
7,000	.....	.0100	.0009	.....	
7,500	.....	.0107	.0007	.....	
8,000	.....	.0117	.0010	.....	
8,500	.....	.0126	.0009	.....	
9,000	.....	.0133	.0007	.....	
9,500	.....	.0141	.0008	.....	
10,000	.....	.0150	.0009	.0046	Ultimate strength.
10,500	.....	.0159	.0009	.....	
11,000	.....	.0167	.0008	.....	
11,500	.....	.0177	.0010	.....	
11,820	2,320	.....	.....	.....	

No. 5006a.

PORTLAND RED SANDSTONE.

COMPRESSION TEST.



Sectional area, 23.70 square inches.

Gauged length, 20".

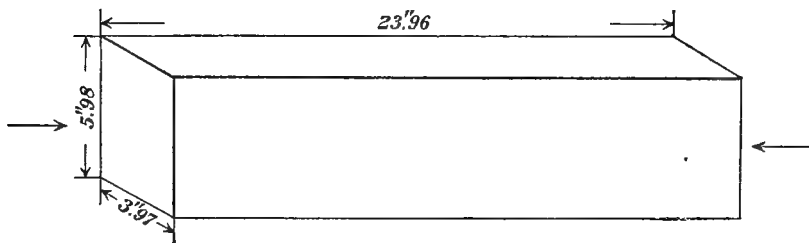
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,370	100	0.	0.	Initial load.
4,740	200	.0012	.....	
9,480	400	.0048	.....	
14,220	600	.0080	.....	
18,960	800	.0107	.....	
23,700	1,000	.0133	.0052	
33,180	1,400	.0177	.....	} E=2,740,000.
42,660	1,800	.0220	.....	
52,140	2,200	.0257	.....	
61,620	2,600	.0298	.....	
71,100	3,000	.0335	.0108	} E=2,703,000.
80,580	3,400	.0374	.....	
90,060	3,800	.0411	.....	
99,540	4,200	.0445	.....	
109,020	4,600	.0482	.....	} Ultimate strength.
118,500	5,000	.0520	.0145	
127,980	5,400	.0566	.....	
137,460	5,800	.0606	.....	
146,300	6,173	.....	.....	

Oblique longitudinal fractures separating stone into wedge shaped fragments.

No. 5007a.

OHIO SANDSTONE.

COMPRESSION TEST.



Sectional area, 23.74 square inches.

Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,374	100	0.	0.	Initial load.
4,748	200	.0016	.....	
9,496	400	.0053	.....	} E = 1,887,000.
14,244	600	.0097	.....	
18,992	800	.0137	.0024	
23,740	1,000	.0174	.0035	
28,488	1,200	.0205	.....	
33,236	1,400	.0231	.0046	
37,984	1,600	.0258	.....	
42,732	1,800	.0280	.0052	
47,480	2,000	.0303	.....	
42,732	1,800	.0288	.....	
37,984	1,600	.0273	.....	
33,236	1,400	.0255	.....	
28,488	1,200	.0238	.....	
23,740	1,000	.0216	.....	
18,992	800	.0194	.....	
14,244	600	.0167	.....	} E = 2,353,000.
9,496	400	.0134	.....	
4,748	200	.0090	.0058	
4,748	200	.0075	.....	
9,496	400	.0110	.....	
14,244	600	.0143	.....	
18,992	800	.0172	.....	
23,740	1,000	.0197	.....	
28,488	1,200	.0220	.....	
33,236	1,400	.0241	.....	
37,984	1,600	.0262	.....	
42,732	1,800	.0282	.....	
47,480	2,000	.0301	.....	
20,000	840	.....	.....	} E = 2,128,000.
23,740	1,000	.0205	.....	
47,480	2,000	.0298	.....	
52,228	2,200	.0318	.0060	
56,976	2,400	.0342	.....	
61,724	2,600	.0360	.0068	
66,472	2,800	.0384	.....	
71,220	3,000	.0403	.0073	
71,220	3,000	.0407	.....	
75,968	3,200	.0425	.....	
80,716	3,400	.0442	.....	
85,464	3,600	.0462	.....	
90,212	3,800	.0482	.....	
94,960	4,000	.0503	.....	
71,220	3,000	.0435	.....	
47,480	2,000	.0354	.....	
23,740	1,000	.0252	.0079	
23,740	1,000	.0222	.....	
47,480	2,000	.0327	.....	



## No. 5007a—Continued.

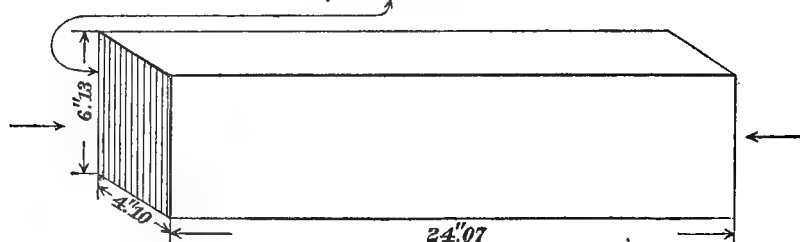
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
71, 220	3, 000	.0418	.....	E = 1,980,000.
94, 960	4, 000	.0509	.....	
99, 708	4, 200	.0527	.....	
104, 456	4, 400	.0548	.....	
109, 204	4, 600	.0568	.....	
113, 952	4, 800	.0589	.....	
118, 700	5, 000	.0614	.....	
94, 960	4, 000	.0548	.....	
71, 220	3, 000	.0470	.....	
47, 480	2, 000	.0382	.....	
23, 740	1, 000	.0270	.0089	
23, 740	1, 000	.0233	.....	
47, 480	2, 000	.0345	.....	
71, 220	3, 000	.0440	.....	
94, 960	4, 000	.0530	.....	
118, 700	5, 000	.0622	.....	Ultimate strength.
123, 448	5, 200	.0649	.....	
128, 196	5, 400	.0673	.....	
132, 944	5, 600	.0708	.....	
137, 692	5, 800	.0748	.....	
138, 500	5, 834	.....	.....	

No. 5008a.

MONSON (ME.) SLATE.

COMPRESSION TEST.

*Lines showing direction  
of cleavage planes  
of the stone.*



Sectional area, 25.13 square inch.  
Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	Initial load.          E = 12,500,000. Snapping sounds. Longitudinal cracks opened. E = 8,690,000. Ultimate strength.
2,513	100	0.	0.	
5,026	200	.0001	.....	
10,052	400	.0003	.....	
15,078	600	.0006	.....	
20,104	800	.0009	.....	
35,130	1,000	.0011	.0002	
50,260	2,000	.0018	.....	
75,390	3,000	.0026	.....	
100,520	4,000	.0037	0.	
125,650	5,000	.0050	.....	
150,700	6,000	.0067	.....	
175,830	7,000	.0086	.0001	
200,960	8,000	.0109	.0001	
208,900	8,313	.....	.....	

Failed by opening longitudinal seams following cleavage planes of the stone.

No. 5009a.

## NORTH RIVER BLUESTONE.

## COMPRESSION TEST.

Length, 23'' .98.

Sectional area, 6''  $\times$  4'' = 24'' square inches.

Gauged length, 20''.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,400	100	0.	0.	Initial load.
4,800	200	.0001	.....	E = 7,500,000.
9,600	400	.0006	.....	
14,400	600	.0012	.....	
19,200	800	.0020	.....	
24,000	1,000	.0027	.0003	
33,600	1,400	.0045	.....	E = 4,651,000.
43,200	1,800	.0065	.....	
52,800	2,200	.0085	.....	
62,400	2,600	.0108	.....	
72,000	3,000	.0129	.0019	
81,600	3,400	.0150	.....	E = 4,444,000.
91,200	3,800	.0170	.....	
100,800	4,200	.0190	.....	
110,400	4,600	.0210	.0030	
120,000	5,000	.0230	.....	
129,600	5,400	.0249	.....	E = 5,405,000.
139,200	5,800	.0265	.....	
148,800	6,200	.0281	.....	
158,400	6,600	.0300	.....	
168,000	7,000	.0315	.0041	
177,600	7,400	.0332	.....	E = 6,153,000.
187,200	7,800	.0347	.....	
196,800	8,200	.0360	.....	
206,400	8,600	.0375	.....	
216,000	9,000	.0389	.0050	
225,600	9,400	.0403	.....	E = 7,273,000.
235,200	9,800	.0415	.....	
244,800	10,200	.0428	.....	
254,400	10,600	.0439	.....	
264,000	11,000	.0450	.....	
216,000	9,000	.0407	.....	E = 7,017,000.
168,000	7,000	.0357	.....	
120,000	5,000	.0297	.....	
72,000	3,000	.0219	.....	
24,000	1,000	.0110	.0056	
24,000	1,000	.0084	.....	E = 8,696,000.
72,000	3,000	.0170	.....	
120,000	5,000	.0260	.....	
168,000	7,000	.0335	.....	
216,000	9,000	.0398	.....	
264,000	11,000	.0453	.....	E = 8,696,000.
216,000	9,000	.0410	.....	
168,000	7,000	.0359	.....	
216,000	9,000	.0406	.....	
264,000	11,000	.0455	.0057	
273,600	11,400	.0467	.....	E = 8,696,000.
283,200	11,800	.0478	.....	
292,800	12,200	.0488	.....	
302,400	12,600	.0499	.....	
312,000	13,000	.0510	.0059	
321,600	13,400	.0523	.....	E = 8,696,000.
331,200	13,800	.0535	.....	
340,800	14,200	.0544	.....	
350,400	14,600	.0555	.....	
360,000	15,000	.0565	.....	
312,000	13,000	.0524	.....	E = 8,696,000.
264,000	11,000	.0430	.....	
216,000	9,000	.0433	.....	
168,000	7,000	.0380	.....	
120,000	5,000	.0318	.....	
72,000	3,000	.0235	.....	E = 8,696,000.
24,000	1,000	.0122	.0064	

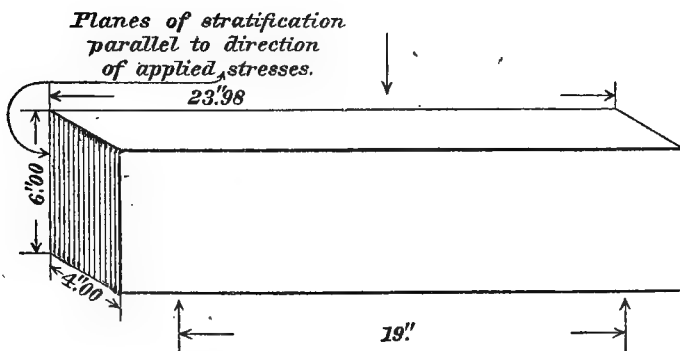
## No. 5009a—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
24,000	1,000	.0092	.....	
72,000	3,000	.0180	.....	
120,000	5,000	.0270	.....	
168,000	7,000	.0345	.....	
216,000	9,000	.0410	.....	
360,000	15,000	.0567	.....	
264,000	11,000	.0480	.....	
240,000	.....	.....	.....	} Rested under this load over night—15 hours. Load on stone in the morning.
216,000	9,000	.0436	.....	
168,000	7,000	.0385	.....	
120,000	5,000	.0322	.....	
72,000	3,000	.0241	.....	
24,000	1,000	.0129	.0070	
24,000	1,000	.0098	.....	} E=8,163,000.
72,000	3,000	.0185	.....	
120,000	5,000	.0274	.....	
168,000	7,000	.0350	.....	
216,000	9,000	.0412	.....	
264,000	11,000	.0467	.....	
273,600	13,000	.0517	.....	
360,000	15,000	.0565	.....	
369,600	15,400	.0575	.....	
379,200	15,800	.0584	.....	
388,800	16,200	.0593	.....	
398,400	16,600	.0603	.....	
408,000	17,000	.0614	.....	
360,000	15,000	.0572	.....	
312,000	13,000	.0530	.....	
264,000	11,000	.0485	.....	
216,000	9,000	.0438	.....	
168,000	7,000	.0385	.....	
120,000	5,000	.0321	.....	
72,000	3,000	.0238	.....	
24,000	1,000	.0125	.0068	
24,000	1,000	.0093	.....	} E=8,163,000.
72,000	3,000	.0184	.....	
120,000	5,000	.0275	.....	
168,000	7,000	.0350	.....	
216,000	9,000	.0415	.....	
264,000	11,000	.0469	.....	
312,000	13,000	.0519	.....	
360,000	15,000	.0568	.....	
408,000	17,000	.0617	.....	
417,600	17,400	.0630	.....	
427,200	17,800	.0640	.....	
436,800	18,200	.0648	.....	
446,400	18,600	.0657	.....	
456,000	19,000	.0666	.....	
408,000	17,000	.0628	.....	
360,000	15,000	.0585	.....	
312,000	13,000	.0541	.....	
264,000	11,000	.0495	.....	
216,000	9,000	.0447	.....	
168,000	7,000	.0392	.....	
120,000	5,000	.0320	.....	
72,000	3,000	.0243	.....	
24,000	1,000	.0129	.0071	
24,000	1,000	.0099	.....	
72,000	3,000	.0187	.....	
120,000	5,000	.0279	.....	
168,000	7,000	.0355	.....	
216,000	9,000	.0420	.....	
264,000	11,000	.0475	.....	
312,000	13,000	.0523	.....	
360,000	15,000	.0573	.....	
408,000	17,000	.0620	.....	
456,000	19,000	.0667	.0069	Test discontinued.

No. 5009b.

## NORTH RIVER BLUESTONE.

## TRANSVERSE TEST.



Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
Pounds.	Pounds.	Inch.	Inch.	Inch.	
500	.....	0.	0.	0.	Initial load.
1,000	.....	.0005	.0005	.....	
1,500	.....	.0010	.0005	.....	
2,000	.....	.0015	.0005	.....	
2,500	.....	.0018	.0003	.0003	
3,000	.....	.0022	.0004	.....	
3,500	.....	.0026	.0004	.....	
4,000	.....	.0030	.0004	.....	
4,500	.....	.0034	.0004	.....	
5,000	.....	.0037	.0003	.0008	
5,500	.....	.0041	.0004	.....	
6,000	.....	.0044	.0003	.....	
6,500	.....	.0048	.0004	.....	
7,000	.....	.0051	.0003	.....	
7,500	.....	.0055	.0004	.0010	
8,000	.....	.0060	.0005	.....	
8,500	.....	.0063	.0003	.....	
9,000	.....	.0066	.0003	.....	
9,500	.....	.0070	.0004	.....	
10,000	.....	.0073	.0003	.0015	
10,500	.....	.0077	.0004	.....	
11,000	.....	.0081	.0004	.....	
11,500	.....	.0085	.0004	.....	
12,000	.....	.0088	.0003	.....	
12,500	.....	.0092	.0004	.0020	
13,000	.....	.0096	.0004	.....	
13,500	.....	.0099	.0003	.....	
14,000	.....	.0103	.0004	.....	
14,500	.....	.0107	.0004	.....	
15,000	.....	.0112	.0005	.0024	
15,500	.....	.0117	.0005	.....	
16,000	.....	.0120	.0003	.....	
16,500	.....	.0125	.0005	.....	
17,000	.....	.0129	.0004	.....	
17,500	.....	.0133	.0004	.0030	
18,000	.....	.0136	.0003	.....	
19,000	.....	.0143	.0007	.....	
19,500	.....	.0147	.0004	.....	
20,000	.....	.0151	.0004	.0035	
20,500	.....	.0158	.0007	.....	
21,000	.....	.0163	.0005	.....	
21,500	.....	.0167	.0004	.....	
22,000	.....	.0171	.0004	.....	
22,400	4,433	.....	.....	.....	Ultimate strength.

No. 5010a.

## WORCESTER GRANITE.

## COMPRESSION TEST.

Length, 24".02.

Sectional area  $6''.01 \times 4''.01 = 24.1$  square inches.

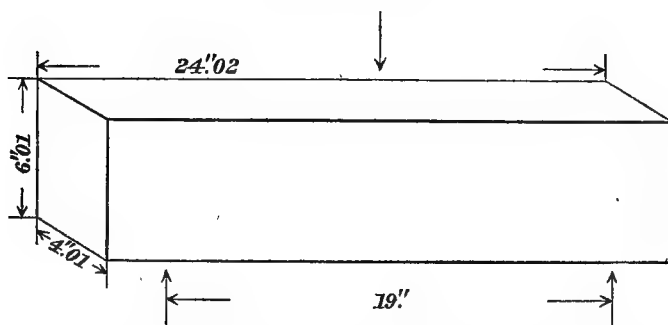
Gauged length 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
		0.	0.	Initial load.
2, 410	100	.....	.....	
4, 820	200	.0005	.....	
9, 040	400	.0016	.....	
14, 460	600	.0025	.....	
19, 280	800	.0034	.....	
24, 100	1, 000	.0042	.0010	
33, 740	1, 400	.0055	.....	
43, 380	1, 800	.0068	.....	
53, 020	2, 200	.0080	.....	} E=7,547,000.
62, 660	2, 600	.0090	.....	
72, 300	3, 000	.0101	.0016	
81, 940	3, 400	.0111	.....	
91, 580	3, 800	.0121	.....	} E=8,511,000.
101, 220	4, 200	.0129	.....	
110, 860	4, 600	.0140	.....	} Cracks at one corner.
120, 500	5, 000	.0150	.0018	
130, 140	5, 400	.0158	.....	
139, 780	5, 800	.0168	.....	} E=8,696,000.
149, 420	6, 200	.0177	.....	
159, 060	6, 600	.0187	.....	
168, 700	7, 000	.0199	.....	
120, 500	5, 000	.0187	.....	} E=8,889,000.
72, 300	3, 000	.0112	.....	
24, 100	1, 000	.0058	.0021	
24, 100	1, 000	.0050	.....	
72, 300	3, 000	.0103	.....	
120, 500	5, 000	.0150	.....	} E=8,889,000.
168, 700	7, 000	.0197	.....	
178, 340	7, 400	.0207	.....	
187, 980	7, 800	.0217	.....	
197, 620	8, 200	.0225	.....	
207, 260	8, 600	.0233	.....	
216, 900	9, 000	.0243	.....	} Pieces flaked off edges at one end.
168, 700	7, 000	.0203	.....	
120, 500	5, 000	.0160	.....	
72, 300	3, 000	.0116	.....	
24, 100	1, 000	.0060	.0020	
24, 100	1, 000	.0050	.....	
72, 300	3, 000	.0106	.....	
120, 500	5, 000	.0155	.....	
168, 700	7, 000	.0200	.....	
216, 900	9, 000	.0242	.0022	Test discontinued.

No. 5010b.

WORCESTER GRANITE.

TRANSVERSE TEST.



Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	.....	0.	0.	0.	Initial load.
1,000	.....	.0008	.0008	.....	
1,500	.....	.0016	.0008	.....	
2,000	.....	.0022	.0006	.....	
2,500	.....	.0028	.0006	.0008	
3,000	.....	.0035	.0007	.....	
3,500	.....	.0040	.0005	.....	
4,000	.....	.0046	.0006	.....	
4,500	.....	.0051	.0005	.....	
5,000	.....	.0057	.0006	.0014	
5,500	.....	.0062	.0005	.....	
6,000	.....	.0067	.0005	.....	
6,500	.....	.0072	.0005	.....	
7,000	.....	.0077	.0005	.....	
7,500	.....	.0083	.0006	.0019	
8,000	.....	.0088	.0005	.....	Ultimate strength.
8,500	.....	.0093	.0005	.....	
9,000	.....	.0098	.0005	.....	
9,500	.....	.0103	.0005	.....	
10,000	.....	.0108	.0005	.....	
10,500	2,066	.0117	.0009	.....	

Sustained maximum load  $\frac{1}{2}$  minute, then fractured.

No. 5011a.

## QUINCY GRANITE.

## COMPRESSION TEST.

Length, 24".

Sectional area, 4" × 6" = 24 square inches.

Gauged length, 20".

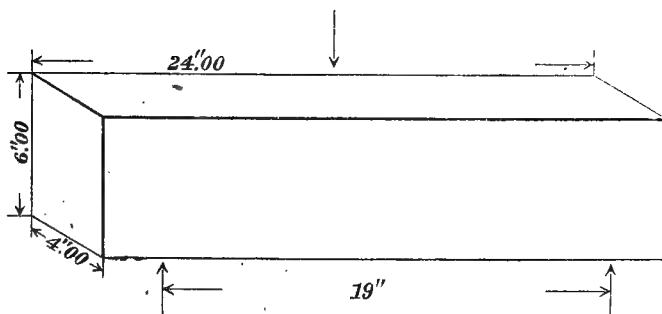
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
2,400	100	0.	0.	Initial load.
4,800	200	.0003	.....	
9,600	400	.0012	.....	
14,400	600	.0022	.....	
19,200	800	.0031	.....	
24,000	1,000	.0040	.0008	
33,600	1,400	.0056	.....	
43,200	1,800	.0068	.....	
52,800	2,200	.0081	.....	E=6,776,000.
62,400	2,600	.0091	.....	
72,000	3,000	.0103	.0012	
81,600	3,400	.0110	.....	
91,200	3,800	.0122	.....	
100,800	4,200	.0132	.....	E=8,696,000.
110,400	4,600	.0142	.....	
120,000	5,000	.0152	.0015	
129,600	5,400	.0163	.....	
139,200	5,800	.0173	.....	
148,800	6,200	.0183	.....	E=8,333,000.
158,400	6,600	.0193	.....	
168,000	7,000	.0203	.0018	
177,600	7,400	.0211	.....	
187,200	7,800	.0221	.....	
196,800	8,200	.0230	.....	E=10,526,000.
206,400	8,600	.0238	.....	
216,000	9,000	.0248	.0025	Snapping sounds.
225,600	9,400	.0261	.....	Snapping sounds repeated.
235,200	9,800	.0268	.0026	
244,800	10,200	.0278	.....	E=8,889,000.
254,400	10,600	.0286	.....	
264,000	11,000	.0296	.0028	
273,600	11,400	.0305	.....	
283,200	11,800	.0315	.....	
292,800	12,200	.0323	.....	E=10,000,000.
302,400	12,600	.0333	.....	
312,000	13,000	.0339	.....	
264,000	11,000	.0303	.....	Small pieces flaked off at two corners.
216,000	9,000	.0263	.....	
168,000	7,000	.0220	.....	
120,000	5,000	.0177	.....	
72,000	3,000	.0128	.....	
24,000	1,000	.0069	.0031	
24,000	1,000	.0060	.....	
72,000	3,000	.0119	.....	
120,000	5,000	.0168	.....	
168,000	7,000	.0213	.....	
216,000	9,000	.0256	.....	
264,000	11,000	.0298	.....	
312,000	13,000	.0343	.0033	Test discontinued.



No. 5011b.

QUINCY GRANITE.

TRANSVERSE TEST.



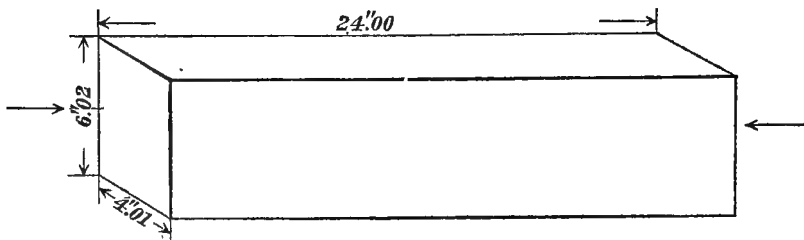
Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
<i>Pounds.</i>		<i>Inch.</i>	<i>Inch.</i>	<i>Inch.</i>	
500	.....	0.	0.	0.	Initial load.
1,000	.....	.0006	.0006	.....	
1,500	.....	.0015	.0009	.....	
2,000	.....	.0022	.0007	.....	
2,500	.....	.0030	.0008	.0007	
3,000	.....	.0040	.0010	.....	
3,500	.....	.0046	.0006	.....	
4,000	.....	.0051	.0005	.....	
4,500	.....	.0058	.0007	.....	
5,000	.....	.0065	.0007	.0015	
5,500	.....	.0070	.0005	.....	
6,000	.....	.0076	.0006	.....	
6,500	.....	.0082	.0006	.....	
7,000	.....	.0087	.0005	.....	
7,500	.....	.0092	.0005	.0019	
8,000	.....	.0098	.0006	.....	
8,500	.....	.0103	.0005	.....	
9,000	.....	.0108	.0005	.....	
9,500	.....	.0113	.0005	.....	Ultimate strength.
10,000	1,979	.....	.....	.....	

Sustained maximum load momentarily, then fractured.

No. 5012a.

## CAPE ANN GRANITE.

## COMPRESSION TEST.



Sectional area, 24'' .14.

Gauged length, 19'' .93.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
		0.	0.	Initial load.
2,414	100	.....	.....	} E=6,477,000.
4,828	200	.0006	.....	
9,656	400	.0016	.....	
14,484	600	.0025	.....	
19,312	800	.0034	.....	
24,140	1,000	.0043	.0005	
36,210	1,500	.0063	.....	
60,350	2,500	.0097	.0008	
72,420	3,000	.0111	.....	
84,490	3,500	.0126	.....	
72,420	3,000	.0115	.....	} E=6,944,000.
60,350	2,500	.0101	.....	
36,210	1,500	.0073	.....	
24,140	1,000	.0055	.....	
12,070	500	.0035	.0011	
12,070	500	.0030	.....	
24,140	1,000	.0050	.....	
36,210	1,500	.0067	.....	
60,350	2,500	.0098	.....	
72,420	3,000	.0112	.....	
84,490	3,500	.0127	.....	} E=8,197,000
96,560	4,000	.0140	.....	
108,630	4,500	.0155	.....	
120,700	5,000	.0170	.....	
108,630	4,500	.0158	.....	
96,560	4,000	.0146	.....	
84,490	3,500	.0133	.....	
72,420	3,000	.0120	.....	
60,350	2,500	.0108	.....	
48,280	2,000	.0093	.....	
36,210	1,500	.0078	.....	
24,140	1,000	.0060	.....	
12,070	500	.0037	.0012	
12,070	500	.0032	.....	
24,140	1,000	.0052	.....	
36,210	1,500	.0071	.....	
48,280	2,000	.0087	.....	
60,350	2,500	.0102	.....	
72,420	3,000	.0116	.....	
84,490	3,500	.0130	.....	
96,560	4,000	.0143	.....	
108,630	4,500	.0157	.....	
120,700	5,000	.0170	.....	
132,770	5,500	.0182	.....	
144,840	6,000	.0195	.....	
156,910	6,500	.0209	.....	
168,980	7,000	.0220	.....	
181,050	7,500	.0233	.....	
193,120	8,000	.0246	.....	

## No. 5012a—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i>	<i>Pounds.</i>	<i>Inch.</i>	<i>Inch.</i>	
168,980	7,000	.0225	.....	E=8,386,000.
144,840	6,000	.0202	.....	
120,700	5,000	.0180	.....	
96,560	4,000	.0155	.....	
72,420	3,000	.0128	.....	
48,280	2,000	.0100	.....	
24,140	1,000	.0063	.0015	
24,140	1,000	.0055	.....	
48,280	2,000	.0090	.....	
72,420	3,000	.0120	.....	
96,560	4,000	.0147	.....	
120,700	5,000	.0173	.....	
144,840	6,000	.0199	.....	
168,980	7,000	.0224	.....	
193,120	8,000	.0246	.....	
205,190	8,500	.0260	.....	
217,260	9,000	.0270	.....	
229,330	9,500	.0283	.....	
241,400	10,000	.0295	.....	
253,470	10,500	.0307	.....	
265,540	11,000	.0319	.....	
277,610	11,500	.0331	.....	
289,680	12,000	.0344	.....	
265,510	11,000	.0323	.....	E=8,897,000.
241,400	10,000	.0302	.....	
217,260	9,000	.0280	.....	
193,120	8,000	.0258	.....	
168,980	7,000	.0235	.....	
144,840	6,000	.0212	.....	
120,700	5,000	.0188	.....	
96,560	4,000	.0162	.....	
72,420	3,000	.0135	.....	
48,280	2,000	.0103	.....	
24,140	1,000	.0067	.0018	
24,140	1,000	.0056	.....	
48,280	2,000	.0092	.....	
72,420	3,000	.0123	.....	
96,560	4,000	.0151	.....	
120,700	5,000	.0178	.....	
144,840	6,000	.0202	.....	
168,980	7,000	.0227	.....	
193,120	8,000	.0252	.....	
217,260	9,000	.0277	.....	
241,400	10,000	.0299	.....	
265,540	11,000	.0322	.....	
289,680	12,000	.0345	.....	Cracked at one corner.
301,750	12,500	.0357	.....	
313,820	13,000	.0368	.....	
325,890	13,500	.0380	.....	
337,960	14,000	.0392	.....	
350,030	14,500	.0402	.....	
313,820	13,000	.0372	.....	
289,680	12,000	.0352	.....	
265,540	11,000	.0330	.....	
241,400	10,000	.0310	.....	
217,260	9,000	.0287	.....	
193,120	8,000	.0265	.....	
168,980	7,000	.0241	.....	
144,840	6,000	.0217	.....	
120,700	5,000	.0192	.....	
96,560	4,000	.0166	.....	
72,420	3,000	.0138	.....	
48,280	2,000	.0106	.....	
24,140	1,000	.0067	.0020	
24,140	1,000	.0058	.....	
48,280	2,000	.0095	.....	
72,420	3,000	.0125	.....	
96,560	4,000	.0153	.....	
120,700	5,000	.0180	.....	
144,840	6,000	.0205	.....	
168,980	7,000	.0230	.....	
193,120	8,000	.0255	.....	
217,260	9,000	.0280	.....	
241,400	10,000	.0302	.....	Corners flaked off.
265,540	11,000	.0325	.....	
289,680	12,000	.0348	.....	
550,000	22,784	.....	.....	

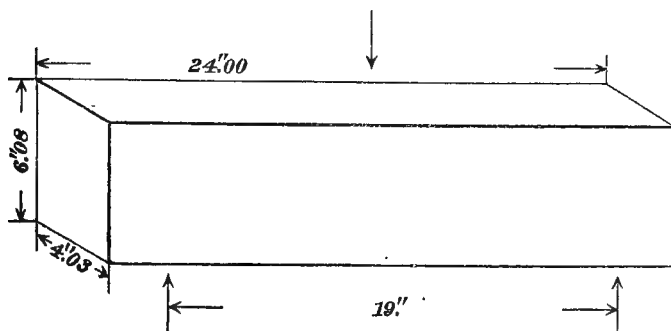
## No. 5012a—Continued.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
<i>Pounds.</i> 2,414	<i>Pounds.</i> 100	<i>Inch.</i> .....	<i>Inch.</i> .0035	No allowance made for reduction in sectional area on account of corners flaking off.
48,280	2,000	.0122	.....	
96,560	4,000	.0177	.....	
144,840	6,000	.0232	.....	
193,120	8,000	.0287	.....	
241,400	10,000	.0335	.....	
289,680	12,000	.0383	.....	
241,400	10,000	.0338	.....	
193,120	8,000	.0294	.....	
144,840	6,000	.0242	.....	
96,560	4,000	.0190	.....	
48,280	2,000	.0126	.0035	
289,680	12,000	.0385	.....	
313,820	13,000	.0409	.....	
337,960	14,000	.0432	.....	
362,100	15,000	.0455	.....	
386,240	16,000	.0477	.....	
410,380	17,000	.0502	.....	
434,520	18,000	.0525	.....	
458,660	19,000	.0548	.....	
482,800	20,000	.0567	.....	
458,660	19,000	.0548	.....	
434,520	18,000	.0529	.....	
410,380	17,000	.0510	.....	
386,240	16,000	.0487	.....	
362,100	15,000	.0467	.....	
337,960	14,000	.0448	.....	
313,820	13,000	.0420	.....	
289,680	12,000	.0400	.....	
241,400	10,000	.0353	.....	
193,120	8,000	.0303	.....	
144,840	6,000	.0252	.....	
96,560	4,000	.0195	.....	
48,280	2,000	.0130	.0037	
584,100	24,196	.....	.....	Ultimate strength.

No. 5021.

CAPE ANN GRANITE. SECOND SPECIMEN.

TRANSVERSE TEST.



Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
Pounds.	Pounds.	Inch.	Inch.	Inch.	
500	.....	0.	0.	0.	Initial load.
1,000	.....	.0008	.0008	.....	
1,500	.....	.0013	.0005	.....	
2,000	.....	.0018	.0005	.....	
2,500	.....	.0023	.0005	.0005	
3,000	.....	.0027	.0004	.....	
3,500	.....	.0032	.0005	.....	
4,000	.....	.0037	.0005	.....	
4,500	.....	.0040	.0003	.....	
5,000	.....	.0045	.0005	.0010	
5,500	.....	.0049	.0004	.....	
6,000	.....	.0052	.0003	.....	
6,500	.....	.0055	.0003	.....	
7,000	.....	.0059	.0004	.....	
7,500	.....	.0064	.0005	.0012	
8,000	.....	.0070	.0006	.....	
8,500	.....	.0072	.0002	.....	
9,000	.....	.0076	.0004	.....	
9,500	.....	.0080	.0004	.....	
10,000	.....	.0083	.0003	.0016	
10,500	.....	.0088	.0005	.....	Ultimate strength.
11,000	.....	.0093	.0005	.....	
11,500	.....	.0097	.0004	.....	
12,000	.....	.0101	.0004	.....	
12,500	2,392	.....	.....	.....	

TABULATION OF COMPRESSION AND TRANSVERSE TESTS OF STONES.

Compression tests.					Transverse tests.							
Num-ber of test.	Name of stone.	Dimensions.			Sectional area.	Maximum load.		Number of test.	Distance between end sup-ports.	Ultimate resistance.	Maximum fiber stress.	Remarks.
		Length.	Breadth.	Depth.		Total.	Per square inch.					
		<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Sq. inches.</i>	<i>Pounds.</i>		<i>Inches.</i>	<i>Pounds.</i>			
5001a	Hoosier buff Oolitic limestone	24	4	6.03	24.12	99,100	4,109					
5002a	Indiana limestone	23.98	4.06	6.03	24.48	122,400	5,000					
5003a	Vermont marble	23.94	3.98	5.99	23.84	214,560	9,000	5003b	13	5,000	988	
5004a	Lee marble	23.97	3.97	6	23.82	381,120	16,000	5004b	19	7,940	1,584	
5005a	Potomac red sandstone.	24.01	4.02	6.01	24.16	314,080	13,000	5005b	19	11,820	2,320	
5006a	Portland red sandstone.	24	3.97	5.97	23.70	146,300	6,173					Ultimate strength.
5007a	Ohio sandstone	23.96	3.97	5.98	23.74	138,500	6,894					Do.
5008a	Monson, Maine, slate	24.07	4.10	6.13	25.13	208,900	8,313					
5009a	North River bluestone.	23.98	4	6	24	456,000	19,000	5009b	19	22,400	4,433	
5010a	Worcester granite.	24.02	4.01	6.01	24.10	216,900	9,000	5010b	19	10,500	2,066	
5011a	Quincy granite.	24	4	6	24	312,000	13,000	5011b	19	10,000	1,979	
5012a	Cape Ann granite.	24	4.01	6.02	24.14	584,100	24,196					Ultimate strength.
	do	24	4.03	6.08				5021	19	12,500	2,392	Second specimen.*

\* Had not been subjected to compression loads.

---

---

**TENSILE TESTS**  
**OF**  
**LINEN SHOT LINES**

**FOR**

**SUPERINTENDENT U. S. LIFE-SAVING SERVICE, WASHINGTON, D. C.**

**LINES MANUFACTURED FROM SMITH & DOVE'S LINEN  
SAIL TWINE.**





## No. 4 SHOT LINES.

Diameter of lines, ".14.

Lay, one turn in ".50.

Three strands of four threads each.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.			
3603	10	13	Inside .....	360	At middle.
3604	10	12	do .....	320	6" from pin.
3605	10	15	do .....	315	1 foot from pin.
3606	10	14	do .....	405	6" from pin.
3607	10	15	do .....	320	At middle.
3608	10	13	do .....	340	Do.
3609	10	14	do .....	315	1 foot from pin.
3610	10	15	do .....	340	Do.
3611	10	13	do .....	335	6" from pin.
3612	10	14	do .....	355	Do.
3613	10	13	do .....	295	At middle.
3614	10	14	do .....	305	Do.
3615	10	14	do .....	350	6" from pin.
3616	10	15	do .....	335	1 foot from pin.
3617	10	14	do .....	315	6" from pin.
3618	10	14	do .....	290	Do.
3619	10	15	do .....	350	1 foot from pin.
3620	10	15	do .....	305	6" from pin.
3621	10	14	do .....	330	1 foot from pin.
3622	11	1	do .....	345	At middle.
3623	10	15	do .....	350	6" from pin.
3624	10	14	do .....	340	Do.
3625	10	15	do .....	330	Do.
3626	10	15	do .....	290	1 foot from pin.
3627	10	15	do .....	315	At middle.
3628	10	14	Outside .....	290	6" from pin.
3629	10	14	do .....	300	At middle.
3630	10	14	do .....	325	1 foot from pin.
3631	10	14	do .....	300	At middle.
3632	10	15	do .....	295	Do.
3633	10	15	do .....	290	1 foot from pin.
3634	10	15	do .....	295	Do.
3635	10	15	do .....	325	6" from pin.
3636	10	15	do .....	300	At middle.
3637	10	15	do .....	325	Do.
3638	10	15	do .....	300	1 foot from pin.
3639	10	15	do .....	295	At middle.
3640	10	15	do .....	310	Do.
3641	10	15	do .....	280	1 foot from pin.
3642	10	15	do .....	250	At pin.
3643	10	15	do .....	260	At middle.
3644	10	15	do .....	300	Do.
3645	10	14	do .....	330	6" from pin.
3646	10	15	do .....	310	1 foot from pin.
3647	10	14	do .....	290	At pin.
3648	10	15	do .....	325	At middle.
3649	10	15	do .....	250	Do.
3650	10	15	do .....	270	At pin.
3651	11	1	do .....	275	Do.
3652	10	14	do .....	300	Do.
3653	10	14	do .....	325	At middle.
3654	10	13	do .....	330	Do.
3655	10	14	do .....	300	1 foot from pin.
3656	10	14	do .....	320	At pin.
3657	10	15	do .....	290	At middle.
3658	11	1	do .....	310	1 foot from pin.
3659	11	2	do .....	280	At pin.
3660	11	1	do .....	280	Do.
3661	11	1	do .....	305	At middle.
3662	11	1	do .....	315	6" from pin.
3663	10	15	do .....	225	1 foot from pin.
3664	11	0	do .....	305	At middle.
3665	10	15	do .....	305	6" from pin.
3666	10	15	do .....	315	At pin.
3667	10	15	do .....	300	1 foot from pin.
3668	10	12	do .....	285	Do.
3669	10	15	do .....	320	Do.
3670	10	15	do .....	305	Do.
3671	10	14	do .....	290	At middle.
3672	10	14	do .....	310	1 foot from pin.
				310	At pin.

## No. 4 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
3673	10	14	Outside .....	295	At middle.
3674	10	14	do .....	285	At pin.
3675	10	15	do .....	295	6" from pin.
3676	10	15	do .....	310	At middle.
3677	10	15	do .....	305	Do.
3678	10	15	do .....	290	Do.
3679	10	14	do .....	285	1 foot from pin.
3680	10	13	do .....	290	Do.
3681	10	14	do .....	290	At pin.
3682	10	14	do .....	285	1 foot from pin.
3683	10	13	do .....	250	Do.
3684	11	1	do .....	300	At middle.
3685	11	0	do .....	325	Do.
3686	11	1	do .....	330	Do.
3687	11	2	do .....	305	At pin.
3688	10	14	do .....	315	At middle.
3689	10	14	do .....	300	6" from pin.
3690	10	14	do .....	295	1 foot from pin.
3691	10	14	do .....	290	6" from pin.
3692	10	13	do .....	290	At middle.
3693	10	13	do .....	315	Do.
3694	10	13	do .....	310	Do.
3694	11	1	do .....	305	Do.
3695	10	14	do .....	290	At pin.
3696	11	11	do .....	300	At middle.
3697	10	14	do .....	300	6" from pin.
3698	10	15	do .....	305	1 foot from pin.
3699	10	14	do .....	290	6" from pin.
3700	10	15	do .....	280	1 foot from pin.
3701	10	13	do .....	320	At pin.
3702	10	14	do .....	295	At middle.
3703	11	6	do .....	310	Do.
3704	11	0	do .....	300	Do.
			do .....	275	1 foot from pin.
3705	11	5	do .....	270	At middle.
			Inside .....	340	6" from pin.
			Outside .....	330	Do.
3706	11	6	do .....	315	Do.
3707	11	5	do .....	305	1 foot from pin.
3708	11	7	do .....	305	6" from pin.
3709	11	6	do .....	320	Do.
3710	11	5	do .....	300	1 foot from pin.
3711	11	5	do .....	350	Do.
3712	11	5	do .....	290	At middle.
3713	11	5	do .....	340	6" from pin.
3714	11	5	do .....	295	Do.
3715	11	3	do .....	330	1 foot from pin.
3716	11	5	do .....	335	At middle.
3717	11	5	do .....	285	1 foot from pin.
3718	11	6	do .....	300	6" from pin.
3719	11	2	do .....	305	At middle.
3720	11	6	do .....	300	6" from pin.
3721	11	4	do .....	305	1 foot from pin.
3722	11	2	do .....	310	At pin.
3723	11	2	do .....	310	At middle.
3724	11	2	do .....	300	6" from pin.
3725	11	4	do .....	280	1 foot from pin.
3726	11	3	do .....	290	At pin.
3727	11	3	do .....	305	Do.
3728	11	2	do .....	310	At middle.
3729	11	1	do .....	305	Do.
3730	11	3	do .....	280	1 foot from pin.
3731	11	4	do .....	300	6" from pin.
3732	11	4	do .....	320	Do.
3733	11	4	do .....	300	At middle.
3734	11	4	do .....	305	6" from pin.
3735	11	3	do .....	300	At middle.
3736	11	4	do .....	310	1 foot from pin.
3737	11	1	do .....	325	At middle.
3738	11	4	do .....	315	1 foot from pin.
3739	11	3	do .....	300	At middle.
3740	11	0	do .....	305	Do.
3741	11	0	do .....	295	6" from pin.
3742	11	6	do .....	290	Do.
			do .....	280	Do.
3743	11	4	do .....	335	At middle.
3744	11	2	Inside .....	300	1 foot from pin.
3745	11	4	do .....	340	At middle.
3746	11	4	do .....	320	6" from pin.

## No. 4 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
3747	11	4	Inside .....	335	At middle.
3748	11	3	do .....	300	1 foot from pin.
3749	11	2	do .....	330	At middle.
3750	11	3	do .....	310	1 foot from pin.
3751	11	1	do .....	305	Do.
3752	11	4	do .....	330	Do.
4039	11	4	Outside .....	305	Do.
4040	11	4	do .....	312	At pin.
			do .....	195	1 foot from pin.
			do .....	264	
4041	11	5	do .....	328	
			do .....	312	
			Inside .....	346	At middle.
4042	11	4	Outside .....	332	1 foot from pin.
4043	11	5	do .....	341	At middle.
4044	11	7½	do .....	373	1½ feet from pin.
4045	11	6	do .....	351	At middle.
4046	11	7½	do .....	338	At pin.
4047	11	8½	do .....	342	Do.
4048	11	8	do .....	332	At middle.
4049	11	8	do .....	354	1 foot from pin.
4050	11	8	do .....	349	At middle.
4051	11	8	do .....	332	Do.
4052	11	7	do .....	347	1 foot from pin.
4053	11	8	do .....	352	At middle.
4054	11	8	do .....	318	Do.
4055	11	8½	do .....	326	1 foot from pin.
4056	11	7	do .....	370	At middle.
4057	11	5	do .....	364	Do.
4058	11	6½	do .....	402	At pin.
4059	11	6½	do .....	397	1 foot from pin.
4060	11	6	do .....	319	At pin.
4061	11	6	do .....	388	Do.
4062	11	6½	do .....	382	1 foot from pin.
4063	11	2	do .....	380	At middle.
4064	11	6	do .....	402	Do.
4065	11	6	do .....	374	At pin.
4066	11	10	do .....	350	Do.
4067	11	6	do .....	299	At middle.
4068	11	8	do .....	348	At pin.
4069	11	8	do .....	346	1 foot from pin.
4070	11	6	do .....	344	Do.
4071	11	8	do .....	376	At middle.
4072	11	8	do .....	351	Do.
4073	11	5	do .....	359	Do.
4074	11	4	do .....	336	1 foot from pin.
4075	11	4	do .....	348	Do.
4076	11	5	do .....	335	At middle.
4077	11	4	do .....	362	Do.
4078	11	8	do .....	336	Do.
4079	11	6	do .....	349	Do.
4080	11	6	do .....	330	1 foot from pin.
4081	11	6	do .....	346	Do.
4082	11	7½	do .....	345	At pin.
4083	11	7	Inside .....	380	Do.
4084	11	6½	do .....	402	1 foot from pin.
4085	11	7½	do .....	378	Do.
4086	11	7½	do .....	340	At middle.
4087	11	6½	do .....	338	1 foot from pin.
4088	11	7½	do .....	344	At middle.
4089	11	6½	do .....	390	At pin.
4090	11	7½	do .....	345	Do.
4091	11	8	do .....	360	At middle.
4092	11	5	do .....	389	1 foot from pin.
4093	11	8	do .....	379	At middle.
4094	11	6½	do .....	398	Do.
4095	11	8	do .....	359	At pin.
4096	11	7	do .....	329	1 foot from pin.
4097	11	4	do .....	361	At pin.
4098	11	8	do .....	310	At middle.
4099	11	7	do .....	390	At pin.
4100	11	6	do .....	315	At middle.
4101	11	6	do .....	368	1 foot from pin.
4102	11	3	do .....	308	At middle.
4103	11	4	do .....	332	6" from pin.
4104	11	4	do .....	353	At middle.
4105	11	4	do .....	303	At pin.
4106	11	4	do .....	308	At middle.
4107	11	3½	do .....	298	At pin.
4108	11	5	do .....		

## No. 4 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
4109	11	6	Inside .....	347	At middle.
4110	11	6	...do .....	386	1 foot from pin.
4111	11	6	...do .....	352	Do.
4112	11	3½	...do .....	363	At middle.
4113	11	4	...do .....	337	Do.
4114	11	5½	...do .....	332	1 foot from pin.
4115	11	6	...do .....	305	At pin.
4116	11	3½	...do .....	324	At middle.
4117	11	6	...do .....	350	At pin.
4118	11	6	...do .....	328	Do.
4119	11	6	...do .....	308	At middle.
4120	11	6	...do .....	298	Do.
4121	11	6	...do .....	359	1 foot from pin.
4122	11	7	...do .....	341	At middle.
4123	11	4	...do .....	289	Do.
4124	11	4	...do .....	345	Do.
4125	11	5	...do .....	328	Do.
4126	11	6	Outside .....	299	Do.
4127	11	4	...do .....	361	At pin.
4128	11	8	...do .....	278	1 foot from pin.
4129	11	6½	...do .....	274	Do.
4130	11	7	...do .....	319	At middle.
4131	11	3	...do .....	316	1 foot from pin.
4132	11	3	...do .....	320	At pin.
4133	11	5½	...do .....	297	1 foot from pin.
4134	11	3	...do .....	297	At middle.
4135	11	11	...do .....	328	At pin.
4136	11	4	...do .....	322	At middle.
4137	11	8	...do .....	350	At pin.
4138	11	4½	...do .....	342	At middle.
			...do .....	356	At middle (Tested wet).

## NO. 7 SHOT LINES.

Diameter of lines, ".2.

Lay, one turn in ".7.

Three strands of eight threads each.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
3192	18	7	Outside	702	1 foot from pin.
3193	18	11	do	772	At pin.
3194	18	4	do	786	Do.
3195	18	12	do	790	Do.
3196	18	11	do	695	1 foot from pin.
3197	18	14	do	740	At pin.
3198	18	8	do	712	Do.
3199	18	6	do	736	Do.
3200	18	11	do	710	1 foot from pin.
3201	18	9	do	750	At pin.
3202	18	11	do	802	At middle.
3203	18	9	do	780	Do.
3204	18	8	do	418	At pin.
			Inside	810	
3205	18	8	Outside	734	
3206	18	8	do	705	At middle.
3207	18	12	do	694	At pin.
3208	18	12	do	758	At middle.
3209	18	14	do	760	1 foot from pin.
3210	18	12	do	750	At pin.
3211	18	8	do	695	1 foot from pin.
3212	18	9	do	790	At pin.
3213	18	11	do	789	1 foot from pin.
3214	18	9	do	755	At pin.
			do	588	6" from pin.
3215	18	9	do	705	
3216	18	8	do	792	At pin.
3217	18	9	do	672	6" from pin.
3218	18	10	do	698	1 foot from pin.
3219	18	9	do	768	At pin.
3220	18	8	do	730	10" from pin.
3221	18	10	do	790	At pin.
3222	18	10	do	770	1 foot from pin.
3223	18	9	do	678	At middle.
3224	18	11	do	720	At pin.
3225	18	11	do	680	Do.
3226	18	11	do	752	Do.
3227	18	9	do	710	1 foot from pin.
3228	18	9	do	730	At pin.
3229	18	15	do	775	Do.
3230	18	9	do	727	Do.
3231	18	10	do	758	1 foot from pin.
3232	18	11	do	770	15" from pin.
3233	18	10	do	788	At pin.
3234	18	10	do	830	3" from pin.
3235	18	9	do	704	At pin.
3236	18	8	do	708	Do.
3237	18	11	do	648	Do.
3238	18	9	do	698	6" from pin.
3239	18	12	do	768	At middle.
3240	18	7	do	687	At pin.
3241	18	8	Inside	705	Do.
3242	18	12	Outside	787	Do.
3243	18	10	do	738	Do.
3244	18	11	do	772	Do.
3245	18	9	do	712	8" from pin.
3246	18	12	do	726	At pin.
3247	18	9	do	758	6" from pin.
3248	18	12	do	737	At pin.
3249	18	6	do	740	1 foot from pin.
3250	18	11	do	789	At pin.
3251	18	12	do	785	3" from pin.
3252	18	8	do	799	At pin.
3253	18	8	do	792	Do.
3254	18	12	do	773	3" from pin.
3255	18	11	do	792	1 foot from pin.
3256	18	8	do	767	Do.
3257	18	11	do	752	8" from pin.
3258	18	9	do	712	At pin.
3259	18	9	Inside	705	8" from pin.
3260	18	11	do	745	6" from pin.
3261	18	10	Outside	648	1 foot from pin.
			do	800	
3261	18	10	Inside	662	At pin.

## No. 7 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
3262	18	9	Inside .....	760	
3263	18	10	Outside .....	692	10" from pin.
3264	18	8	do .....	692	6" from pin.
3265	18	14	Inside .....	720	At pin.
3266	18	12	do .....	782	1 foot from pin.
3267	18	8	do .....	778	At pin.
3268	18	13	do .....	810	1 foot from pin.
3269	18	6	do .....	791	At pin.
3270	18	8	do .....	787	8" from pin.
3271	18	13	do .....	720	At pin.
3272	18	8	do .....	772	1 foot from pin.
3273	18	8	do .....	692	At pin.
3274	18	8	do .....	748	Do.
			do .....	576	Do.
			do .....	780	
3275	18	5	do .....	674	At pin.
3276	18	12	do .....	815	At middle.
3277	18	9	do .....	766	At pin.
3278	18	11	do .....	704	At middle.
3279	18	9	do .....	788	Do.
3280	18	10	do .....	782	1 foot from pin.
3281	18	10	do .....	895	At pin.
3282	18	7	do .....	681	Do.
3283	18	8	do .....	785	1 foot from pin.
3284	18	10	do .....	785	10" from pin.
3285	18	6	do .....	691	8" from pin.
3286	18	4	do .....	759	6" from pin.
3287	18	13	do .....	648	1 foot from pin.
3288	18	9	do .....	544	6" from pin.
			do .....	728	
3289	18	6	do .....	725	8" from pin.

## ADDITIONAL TESTS OF NO. 7 SHOT LINES.

## No. 3204.

Location of sample in coil.	Tensile strength.	Remarks.
	<i>Pounds.</i>	
200 feet from outside end .....	642	
400 feet from outside end .....	702	
900 feet from outside end .....	592	Parted at long splice which covered 39 inches length of line; 10" from the end of the outside tuck.
1,100 feet from outside end .....	605	Parted at place where two threads were tied together; broke between the knots.
Near middle of coil .....	680	
Do .....	698	
600 feet from inside end .....	685	
400 feet from inside end .....	702	
200 feet from inside end .....	668	

## No. 3288.

Total length of line, about 1,800 feet.

Location of sample in coil.	Tensile strength.	Remarks.
	<i>Pounds.</i>	
Outside end .....	540	
20 feet from outside end .....	715	
200 feet from outside end .....	600	
400 feet from outside end .....	720	
600 feet from outside end .....	758	
800 feet from outside end .....	710	
900 feet from outside end .....	576	Parted in long splice at middle tuck.
1,000 feet from outside end .....	69	
1,100 feet from outside end .....	746	Parted 8" from a knot where several threads were tied together.
1,200 feet from outside end .....	770	
1,400 feet from outside end .....	762	
1,600 feet from outside end .....	735	

## ELONGATION UNDER STRESS.

No. 3286.

Sample from outside end of coil.  
Gauged length, 6 feet.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Successive elongation.	
<i>Pounds.</i>	<i>Inches.</i>	<i>Inches.</i>	
50	2.50	2.50	
100	3.50	1.00	
150	4.50	1.00	
200	4.90	.40	
250	5.20	.30	
300	5.60	.40	
350	5.80	.20	
400	6.10	.30	
450	6.20	.10	
500	6.30	.10	
550	6.50	.20	
600	6.75	.25	
650	6.85	.10	
700	7.00	.15	
704	-----	-----	Tensile strength.

Parted at the pin.

## No. 7.—SHOT LINES.

Waterproofed by means of a coating of paraffine.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	<i>Pounds.</i>	<i>Ounces.</i>			
3290	20	7	Outside.....	<i>Pounds.</i> 710	At pin.
3291	21	5	.....do .....	715	At knot beyond pin.

No. 3291.

## ELONGATIONS UNDER STRESS.

Second sample from outside end of coil.  
Gauged length, 6 feet.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Successive elongation.	
<i>Pounds.</i>	<i>Inches.</i>	<i>Inches.</i>	
50	1.00	1.00	
100	1.70	.70	
150	2.20	.50	
200	2.50	.30	
250	2.80	.30	
300	3.20	.40	
350	3.25	.05	
400	3.35	.10	
450	3.60	.25	
500	3.75	.15	
550	3.98	.28	
600	4.10	.12	
650	4.25	.13	
662	-----	-----	Tensile strength.

Parted 6'' from the pin.

## No. 7 SHOT LINES.

*Second lot.*

Diameter of lines, ".20.

Lay, one turn in ".70.

Three strands of eight threads each.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.			
3888	20	1½	Outside.....	712	At pin.
3889	20	1	do.....	738	Do.
3890	20	2	do.....	708	1 foot from pin.
3891	20	8	do.....	772	At middle.
3892	20	1	do.....	752	At pin.
3893	20	6	do.....	748	At middle.
3894	20	7	do.....	754	Do.
3895	20	7½	do.....	742	Do.
3896	20	7	do.....	722	Do.
3897	20	6	do.....	760	Do.
3898	20	7	do.....	667	Do.
3899	20	9½	do.....	789	Do.
3900	20	11	do.....	794	Do.
3901	20	8	do.....	656	At pin.
3902	20	6	do.....	757	1 foot from pin.
3903	19	14	do.....	710	At pin.
3904	19	14	do.....	739	Do.
3905	19	14	do.....	685	Do.
3906	19	15½	do.....	724	Do.
3907	20	1	do.....	752	Do.
3908	20	1	do.....	755	At middle.
3909	20	1	do.....	748	1 foot from pin.
3910	20	2½	do.....	788	Do.
3911	20	2	do.....	754	6" from pin.
3912	20	1	do.....	715	At middle.
3913	20	8½	do.....	760	Do.
3914	20	1½	do.....	713	At pin.
3915	20	2	do.....	790	Do.
3916	20	5½	do.....	788	At middle.
3917	20	7½	do.....	802	Do.
3918	20	6	do.....	755	1 foot from pin.
3919	20	7½	do.....	775	At pin.
3920	20	5½	do.....	797	Do.
3921	20	5½	do.....	745	At middle.
3922	20	6	do.....	784	At pin.
3923	20	6½	do.....	801	Do.
3924	20	2	do.....	752	Do.
3925	20	7½	do.....	810	1 foot from pin.
3926	20	10½	do.....	815	At pin.
3927	20	13	do.....	810	Do.
3928	20	7½	do.....	793	1 foot from pin.
3929	20	4½	do.....	800	At middle.
3930	20	4½	do.....	770	Do.
3931	20	7½	do.....	580	At pin.
3932	20	1	do.....	660	At middle.
3933	20	1	do.....	694	At pin.
3934	20	1½	do.....	705	At middle.
3935	20	2	do.....	790	At pin.
3936	20	2	do.....	688	Do.
3937	20	3½	do.....	708	1 foot from pin.
3938	20	2	do.....	756	At middle.
3939	20	4	do.....	797	1 foot from pin.
3940	20	2½	do.....	712	Do.
3941	20	7½	do.....	794	At pin.
3942	20	1½	do.....	749	At middle.
3943	20	10½	do.....	777	Do.
3944	20	9	do.....	830	At pin.
3945	20	8	do.....	797	Do.
3946	20	5	do.....	808	1 foot from pin.
3947	20	5½	do.....	835	At pin.
3948	20	4	do.....	790	At middle.
3949	20	4½	do.....	778	At pin.
3950	20	12½	do.....	835	Do.
3951	20	11	do.....	799	At middle.
3952	20	8	do.....	802	Do.
3953	20	2	do.....	797	1 foot from pin.
3954	20	0	do.....	704	At pin.
3955	20	12½	do.....	788	Do.
3956	20	3	do.....	768	At middle.
3957	20	6	do.....	774	At pin.
3958	20	6½	do.....	708	Do.



## No. 7 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.			
3959	20	6½	Outside	753	At pin.
3960	20	8	do	762	At middle.
3961	20	8	do	793	At pin.
3962	20	8½	do	792	Do.
3963	20	8	do	794	At middle.
3964	20	11	do	800	At pin.
3965	20	9	do	795	Do.
3966	20	10½	do	820	Do.
3967	20	8	do	720	Do.
3968	20	9½	do	834	Do.
3969	20	0	do	745	1 foot from pin.
3970	20	4	do	835	At middle.
3971	20	8	do	749	Do.
3972	19	15½	do	747	At pin.
3973	20	6	do	789	Do.
3974	20	1	do	748	Do.
3975	20	14	do	805	At middle.
3976	20	11	do	798	At pin.
3977	20	0	do	799	Do.
3978	20	12½	Inside	870	At middle.
3979	20	10½	do	830	1 foot from pin.
3980	20	11	do	895	At middle.
3981	20	10	do	744	At pin.
3982	20	11½	do	838	At middle.
3983	20	1	do	746	At pin.
3984	20	½	do	750	Do.
3985	20	2	do	791	At middle.
3986	20	2	do	796	At pin.
3987	20	11	do	815	At middle.
3988	20	10	do	784	At pin.
3989	20	10½	do	810	1 foot from pin.
3990	20	12	do	806	At pin.
3991	20	8	do	718	Do.
3992	20	½	do	755	At middle.
3993	20	3	do	714	At pin.
3994	20	4	do	742	Do.
3995	20	3	do	750	At middle.
3996	20	8	do	764	Do.
3997	20	10	do	793	At pin.
3998	20	14	do	855	Do.
3999	20	5½	do	758	At middle.
4000	20	10	do	810	At pin.
4001	19	14	do	702	1 foot from pin.
4002	20	5	do	798	At middle.
4003	20	8	do	805	1 foot from pin.
4004	20	11	do	802	At pin.
4005	20	9	do	800	Do.
4006	20	0	do	705	Do.
4007	20	4	do	786	Do.
4008	20	8	do	804	Do.
4009	20	4½	do	806	Do.
4010	20	4	do	810	At middle.
4011	20	4	do	778	Do.
4012	20	4	do	812	At pin.
4013	20	1	do	768	Do.
4014	19	13	do	812	Do.
4015	20	7	do	796	Do.
4016	20	0	do	795	Do.
4017	20	½	do	742	At middle.
4018	20	9½	do	815	At pin.
4019	20	5	do	808	Do.
4020	19	14	do	800	1 foot from pin.
4021	20	7	do	830	At pin.
4022	20	1	do	789	1 foot from pin.
4023	20	5½	do	747	Do.
4024	20	7	do	812	At middle.
4025	20	7	do	845	1 foot from pin.
4026	19	14½	do	825	At pin.
4027	20	5	do	740	At middle.
4028	20	7	do	812	Do.
4029	20	4	do	715	Do.
4030	20	5½	do	722	1 foot from pin.
4031	20	14	Outside	747	Do.
4032	20	2½	do	697	At pin.
4033	20	5	do	702	Do.
4034	20	4	do	712	Do.
4035	20	0	do	763	Do.
4036	20	1½	do	699	1 foot from pin.
4037	20	1½	do	735	At pin.
4038	20	1	do	705	Do.

## No. 9 SHOT LINES.

Diameter of lines, ".28.

Lay, one turn in ".9.

Three strands of sixteen threads each.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
3398	37	8	Inside .....	1,446	1 foot from pin.
3399	37	8	do .....	1,195	Do.
3400	37	8	do .....	1,484	At middle.
3401	37	8	do .....	1,388	At pin.
3402	37	4	do .....	1,246	1 foot from pin.
3403	37	4	do .....	1,353	At pin.
3404	37	4	do .....	1,192	Do.
3405	38	0	do .....	1,535	Do.
3406	37	4	do .....	1,205	Do.
3407	37	12	do .....	1,200	Do.
3408	37	8	do .....	1,250	Do.
3409	37	4	do .....	1,110	Do.
3410	37	8	do .....	1,250	6" from pin.
3411	36	8	do .....	1,145	1 foot from pin.
3412	36	8	do .....	1,150	At middle.
3413	36	12	do .....	1,160	At pin.
3414	37	12	do .....	1,130	Do.
3415	37	0	do .....	1,135	2 feet from pin.
3416	37	12	do .....	1,360	At pin.
3417	37	8	do .....	1,230	Do.
3418	37	8	do .....	1,170	At middle.
3419	37	8	do .....	1,280	Do.
3420	37	12	do .....	1,395	Do.
3421	36	8	do .....	1,210	At pin.
3422	36	8	do .....	1,090	Do.
3423	37	0	Outside .....	1,100	Do.
3424	37	4	do .....	1,135	Do.
3425	37	4	do .....	1,055	Do.
3426	36	8	do .....	1,035	At middle.
3427	37	12	do .....	1,210	1 foot from pin.
3428	38	0	do .....	1,150	At pin.
3429	37	8	do .....	1,145	Do.
3430	37	8	do .....	1,175	1 foot from pin.
3431	38	0	do .....	1,170	Do.
3432	37	8	do .....	1,170	At pin.
3433	37	12	do .....	1,050	6" from pin.
3434	37	0	do .....	1,185	At middle.
3435	37	0	do .....	1,150	1 foot from pin.
3436	37	4	do .....	1,065	At middle.
3437	37	12	do .....	1,185	At pin.
3438	37	8	do .....	1,130	At middle.
3439	36	8	do .....	1,010	2 feet from pin.
3440	37	12	do .....	1,190	At pin.
3441	37	12	do .....	1,250	6" from pin.
3442	37	12	do .....	1,155	At pin.
3443	36	4	do .....	1,050	6" from pin.
3444	37	8	do .....	1,090	Do.
3445	37	4	do .....	1,090	At pin.
3446	37	4	do .....	1,120	Do.
3447	37	12	do .....	1,115	Do.
3448	37	4	do .....	1,020	Do.
3449	36	8	do .....	1,275	Do.
3450	37	8	do .....	1,065	Do.
3451	37	12	do .....	1,205	Do.
3452	38	0	do .....	1,225	Do.
3453	37	12	do .....	1,145	Do.
3454	37	4	do .....	1,140	Do.
3455	37	4	do .....	1,130	Do.
3456	37	4	do .....	1,295	1 foot from pin.
3457	36	12	do .....	1,110	6" from pin.
3458	37	0	do .....	1,200	At pin.
3459	37	0	do .....	1,130	1 foot from pin.
3460	37	8	do .....	1,150	6" from pin.
3461	37	8	do .....	1,110	At pin.
3462	37	4	do .....	1,015	Do.
3463	38	0	do .....	1,175	Do.
3464	36	12	do .....	1,180	Do.
3465	37	12	do .....	1,225	1 foot from pin.
3466	38	0	do .....	1,350	At pin.
3467	30	12	do .....	1,095	Do.
3468	37	4	do .....	1,205	Do.
3469	36	12	do .....	1,160	3" from pin.

## No. 9 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
3470	37	8	Outside.....	1,130	At pin.
3471	37	8	do.....	1,205	Do.
3472	37	0	do.....	1,050	Do.
3473	37	12	do.....	1,200	Do.
3474	37	8	do.....	1,125	1 foot from pin.
3475	37	4	do.....	1,150	At pin.
3476	36	12	do.....	1,180	Do.
3477	36	12	do.....	1,130	Do.
3478	36	12	do.....	1,160	Do.
3479	36	8	do.....	1,050	Do.
3480	36	8	do.....	980	1 foot from pin.
			Inside.....	1,310	
3481	37	8	Outside.....	1,120	At pin.
3482	37	8	do.....	1,190	Do.
3483	37	8	do.....	1,205	At middle.
3484	37	0	do.....	1,140	At pin.
3485	37	8	do.....	1,080	Do.
3486	37	8	do.....	1,170	Do.
3487	37	8	do.....	1,180	Do.
3488	37	8	do.....	1,175	Do.
3489	37	0	do.....	990	1 foot from pin.
			Inside.....	1,155	
3490	37	12	Outside.....	1,110	At middle.
3491	37	0	do.....	1,220	At pin.
3492	36	12	do.....	1,070	Do.
3493	37	8	do.....	1,115	6" from pin.
3494	37	4	do.....	1,230	At pin.
3495	37	8	Inside.....	1,370	1 foot from pin.
3496	37	8	do.....	1,410	At middle.
3497	38	0	do.....	1,275	At pin.
3498	37	12	do.....	1,295	At middle.
3499	36	8	do.....	1,200	1 foot from pin.
3500	37	4	do.....	1,275	At pin.
3501	36	8	do.....	1,180	Do.
3502	36	12	do.....	1,235	1 foot from pin.
3503	37	8	do.....	1,195	At middle.
3504	37	8	do.....	1,140	1 foot from pin.
3505	36	12	do.....	1,130	At pin.
3506	37	0	do.....	1,290	At middle.
3507	37	8	do.....	1,420	At pin.
3508	37	4	do.....	1,290	1 foot from pin.
3509	37	8	do.....	1,350	At pin.
3510	37	12	do.....	1,250	1 foot from pin.
3511	36	12	do.....	1,375	At pin.
3512	37	8	do.....	1,165	1 foot from pin.
3513	36	12	do.....	1,235	At pin.
3514	38	0	do.....	1,340	1 foot from pin.
3515	36	12	do.....	1,305	Do.
3516	38	12	do.....	1,160	At pin.
3517	38	4	Outside.....	1,180	Do.
3518	38	0	do.....	1,110	Do.
3519	37	4	do.....	1,040	1 foot from pin.
3520	37	12	do.....	1,250	6" from pin.
3521	36	12	do.....	1,140	At pin.
3522	37	8	do.....	1,170	Do.
3523	37	4	do.....	1,150	Do.
3524	36	12	do.....	1,060	Do.
3525	37	4	do.....	1,140	6" from pin.
3526	36	12	do.....	1,125	1 foot from pin.
3527	36	12	do.....	980	Do.
			Inside.....	1,320	
3528	36	12	Outside.....	1,150	At middle.
3529	36	12	do.....	1,152	At pin.
3530	36	8	do.....	1,240	Do.
3531	37	4	do.....	1,180	Do.
3532	36	12	do.....	1,195	Do.
3533	37	8	do.....	1,145	Do.
3534	38	0	do.....	1,180	Do.
3535	38	0	do.....	1,150	Do.
3536	37	12	do.....	1,070	Do.
3537	37	0	do.....	1,200	Do.
3538	37	8	do.....	1,145	Do.
3539	36	12	do.....	1,165	Do.
3540	37	8	do.....	1,140	Do.
3541	36	12	do.....	1,090	1 foot from pin.
3542	37	0	do.....	1,215	Do.
3543	36	12	do.....	1,085	At pin.
3544	36	12	do.....	1,265	1 foot from pin.
3545	36	12	do.....	1,190	At pin.
3546	36	8	do.....	1,195	Do.
3547	37	0	do.....	1,175	Do.

## No. 9 SHOT LINES.

*Second lot.*

Diameter of lines, ".29.

Lay, one turn in ".95.

Three strands of sixteen threads each.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
4139	38	4	Outside.....	1,230	At pin.
4140	37	12	do.....	980	1 foot from pin.
4141	38	0	do.....	1,182	At pin.
4142	38	0	do.....	1,385	Do.
4143	38	0	do.....	1,295	Do.
4144	38	0	do.....	1,233	1 foot from pin.
4145	38	0	do.....	1,198	At pin.
4146	38	4	do.....	1,210	Do.
4147	37	8	do.....	1,240	Do.
4148	38	4	do.....	1,289	Do.
4149	38	4	do.....	1,397	Do.
4150	38	0	do.....	1,040	Do.
4151	38	0	do.....	1,277	Do.
4152	38	4	do.....	1,360	Do.
4153	38	0	do.....	1,325	Do.
4154	38	0	do.....	1,289	Do.
4155	38	4	do.....	1,232	Do.
4156	39	0	do.....	1,249	Do.
4157	38	4	do.....	1,167	Do.
4158	38	0	do.....	1,375	Do.
4159	38	8	do.....	1,308	Do.
4160	38	4	do.....	1,385	Do.
4161	38	4	do.....	1,377	Do.
4162	38	4	do.....	1,240	Do.
4163	38	0	do.....	1,247	Do.
4164	38	4	do.....	1,185	At middle.
4165	38	0	do.....	1,303	Do.
4166	38	0	do.....	1,305	At pin.
4167	38	4	do.....	1,186	At middle.
4168	38	8	do.....	1,248	At pin.
4169	38	8	do.....	1,255	Do.
4170	38	8	do.....	1,326	Do.
4171	38	12	do.....	1,138	Do.
4172	38	12	do.....	1,110	Do.
4173	38	8	do.....	1,278	Do.
4174	38	12	do.....	1,379	Do.
4175	38	8	do.....	1,344	Do.
4176	38	0	do.....	1,125	Do.
4177	38	0	do.....	1,110	Do.
4178	38	0	do.....	1,255	Do.
4179	38	2	do.....	1,165	Do.
4180	38	4	do.....	1,238	Do.
4181	38	4	do.....	1,264	Do.
4182	38	4	do.....	1,275	Do.
4183	38	12	do.....	1,270	Do.
4184	38	8	do.....	1,085	At middle.
4185	37	14	do.....	1,190	Do.
4186	38	2	do.....	1,120	At pin.
4187	38	4	do.....	1,168	Do.
4188	38	4	do.....	1,172	Do.
4189	38	6	do.....	1,183	Do.
4190	38	4	do.....	1,250	Do.
4191	38	12	do.....	1,394	Do.
4192	38	8	do.....	1,400	Do.
4193	38	10	do.....	1,205	Do.
4194	38	8	do.....	1,252	Do.
4195	38	10	do.....	1,085	1 foot from pin.
4196	37	10	do.....	1,157	At pin.
4197	38	2	do.....	1,258	At middle.
4198	38	4	do.....	1,287	1 foot from pin.
4199	38	8	do.....	1,346	At pin.
4200	38	0	do.....	1,172	Do.
4201	38	0	do.....	1,332	Do.
4202	38	2	do.....	1,205	Do.
4203	38	8	Inside.....	1,210	Do.
4204	37	14	do.....	1,280	Do.
4205	38	8	do.....	1,260	Do.
4206	38	4	do.....	1,276	Do.
4207	38	4	do.....	985	Do.
			do.....	1,248	Do.

## No. 9 SHOT LINES—Continued.

No. of test.	Weight of coil.		End of coil tested.	Tensile strength.	Fractured.
	Pounds.	Ounces.		Pounds.	
4208	37	14	Inside .....	1,274	At pin.
4209	38	8	do .....	1,200	Do.
4210	38	8	do .....	1,247	Do.
4211	38	0	do .....	1,045	Do.
4212	37	12	do .....	1,193	Do.
4213	38	0	do .....	1,205	Do.
4214	38	16	do .....	1,170	Do.
4215	38	2	do .....	1,167	Do.
4216	38	2	do .....	1,060	Do.
4217	38	12	do .....	1,198	Do.
4218	38	12	do .....	1,195	Do.
4219	37	14	do .....	1,177	Do.
4220	37	12	do .....	1,110	Do.
4221	38	12	do .....	1,202	Do.
4222	38	0	do .....	1,288	Do.
4223	38	0	do .....	1,149	At middle.
4224	38	2	do .....	1,232	At pin.
4225	38	8	do .....	1,184	At middle.
4226	37	14	do .....	1,247	At pin.
4227	38	0	do .....	1,015	Do.
4228	38	2	do .....	1,070	Do.
4229	38	10	do .....	1,132	1 foot from pin.
4230	38	12	do .....	980	At middle.
			do .....	1,324	
			do .....	870	1 foot from pin.
4231	38	10	do .....	1,215	
4232	37	14	do .....	1,167	At middle.
4233	37	12	do .....	1,047	At pin.
4234	37	14	do .....	1,174	Do.
4235	38	10	do .....	1,168	Do.
4236	37	12	do .....	1,005	Do.
4237	38	6	do .....	1,125	Do.
4238	38	0	do .....	1,090	Do.

## COTTON CLOTH.

Tensile tests of warp and filling strips furnished by bidders for target cloth.

No. of test.	Name of bidders.	Picks.		Weight of 1.15 yards, 75" wide.		Tensile strength.	
		Warp.	Filling.			Warp.	Filling.
		<i>Per inch.</i>	<i>Per inch.</i>	<i>Pounds.</i>	<i>Ounces.</i>	<i>Pounds.</i>	<i>Pounds.</i>
3299	Boston Manufacturing Co.	64	74	1	0.03	123	156
3300	Francis H. Smith. ....	80	30	1	1.48	319	75
3301	J. H. Lane & Co. ....	60	60	1	1.77	166	145
3302	do. ....	50	46		15.06	189	92
3303	do. ....	66	46	1	1.66	182	108
3304	Rowland A. Robbins. ....	60	66		11.70	117	122
3305	do. ....	60	68		10.19	93	106
3306	T. A. Ashburner. ....	54	52		12.60	163	106
3307	do. ....	52	48		12.59	158	72
3308	Catlin & Co. ....	40	58	1	0.20	138	142

## TENSILE TESTS OF MANILLA ROPE FOR ASSISTANT LIGHT-HOUSE INSPECTOR, TOMPKINSVILLE, N. Y.

{Ends of ropes made fast to cleats.}

No. of test.	Marks.	Actual circumference.	Description.		Length.		Weight.				Tensile strength.	Parted.
			Strands.	Threads per strand.	Lay one turn in.	Feet.	Inches.	Total.	Pounds.	Ounces.		
3,858	12 threads	Inches 1 1/4	3	4	1.2	15	9	0	10 1/4	4	Pounds. 1,253	1 strand 6" from cleat.
3,859	18 threads	1 1/4	3	6	1.5	15	5	1	0	6.2	2,190	1 strand 2 feet from cleat.
3,860	21 threads	Full 1 1/4	3	7	1.75	16	7	1	5	7.6	2,490	1 strand at the cleat.
3,861	1"	1 1/4	3	3	1.95	18	1	0	8	3	1,210	1 strand 4" from cleat.
3,862	1 1/4"	1 1/4	3	7	1.7	16	3	1	4 1/2	7.6	2,285	2 strands at the middle.
3,863	2"	2 1/4	3	11	2	16	1	2	2	12.3	3,670	2 strands at the cleat.
3,864	2 1/4"	2 1/4	3	17	2.5	16	4	3	1	2.4	6,620	1 strand at the cleat.
3,865	3"	3 1/4	3	24	3	20	0	5	5 1/2	9.7	8,140	1 strand at the cleat.
3,866	3 1/4"	3 1/4	3	31	3.25	18	11	6	12	2.3	12,400	1 strand at the cleat.
3,867	4"	4 1/4	3	41	3.75	19	4	8	12	11.4	8,900	1 strand at the cleat.
3,868	4 1/4"	4 1/4	3	41	3.6	17	5	8	2	12.8	11,950	1 strand at the cleat.
3,869	5"	5 1/4	3	62	4.25	19	7	14	2	5.6	17,700	1 strand at the cleat.
3,870	5 1/4"	5 1/4	3	77	4.75	25	5	22	10	5.4	19,600	1 strand at the cleat.
3,871	6"	6 1/4	3	93	5.5	26	2	28	10	9.0	20,950	1 strand at the cleat.
4,872	7"	8 1/4	3	124	6	25	1	38	12	12.7	27,600	1 strand at the cleat.
3,883	4 1/4"	4.85	3	52	3.75	.....	.....	.....	.....	.....	16,050	1 strand at the cleat.
3,884	5"	5.45	3	63	4.5	.....	.....	.....	.....	.....	18,600	1 strand at the cleat.
3,885	5 1/4"	6.25	3	73	4.50	.....	.....	.....	.....	.....	19,300	1 strand at the cleat.
3,886	6"	7.00	3	94	5	.....	.....	.....	.....	.....	21,950	1 strand at the cleat.
3,887	7"	8.00	3	126	5.75	.....	.....	.....	.....	.....	27,800	1 strand at the cleat.

## PRIVATE TESTS.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1889.				
July 6	Adhesion of nails.....	Perkins Brothers.....	Bridgewater.....	Mass.
8	Cast-iron.....	Whittier Machine Co.....	South Boston.....	Mass.
10	Pressure gauges.....	Boston Heating Co.....	Boston.....	Mass.
12	Steel and wrought-iron plates.....	Atlantic Works.....	East Boston.....	Mass.
16	Bricks.....	H. W. Ball.....	Boston.....	Mass.
	Wrought-iron bolt.....	Norcross Brothers.....	do.....	Mass.
17	Steel plate.....	F. A. Houdlette & Co.....	do.....	Mass.
18	Belting.....	S. Budlong & Co.....	Providence.....	R. I.
	Steel plate and bars.....	Rhode Island Locomotive Works.....	do.....	R. I.
	do.....	New York Locomotive Works.....	Rome.....	N. Y.
18	Steel plate.....	I. P. Morris Co.....	Philadelphia.....	Pa.
25	Cotton ducking.....	J. H. Lane & Co.....	Boston.....	Mass.
26	Steel plate.....	Wm. Allen & Sons.....	Worcester.....	Mass.
30	Leather belting.....	S. Budlong & Co.....	Providence.....	R. I.
31	Railroad draw-bar.....	Mitis Wrought-Iron Casting Co.....	Neponset.....	Mass.
Aug. 3	Helical car spring.....	John Kent.....	Boston.....	Mass.
9	Spirally wound tube.....	Pneumatic Dynamite Gun Co.....	New York.....	N. Y.
12	Plain and electrically welded wire cable.....	Thomson Electric Welding Co.....	Lynn.....	Mass.
	Composition metal.....	George F. Blake Manufacturing Co.....	Boston.....	Mass.
20	Chain cable.....	Bradlee & Co.....	Philadelphia.....	Pa.
	Wrought-iron plate.....	Boston Bridge Works.....	Boston.....	Mass.
21	Bricks.....	Norcross Brothers.....	do.....	Mass.
	Rolled iron bar.....	A. V. Abbott.....	do.....	Mass.
22	Bricks.....	H. W. Ball.....	do.....	Mass.
31	Riveted chain.....	Mitis Wrought-Iron Casting Co.....	Neponset.....	Mass.
Sept. 2	Steel plate.....	Whittier Machine Co.....	Roxbury.....	Mass.
	do.....	I. P. Morris Co.....	Philadelphia.....	Pa.
2	do.....	George H. Lloyd.....	Boston.....	Mass.
	Steel plates and bars.....	Prof. J. E. Denton.....	Hoboken.....	N. J.
3	Wrought-iron bars.....	B. M. Jones & Co.....	Boston.....	Mass.
12	Steel wire cable.....	Thomson Electric Welding Co.....	do.....	Mass.
14	Wrought-iron plate.....	Boston Bridge Works.....	do.....	Mass.
	Steel wire strand.....	Gen. E. W. Serrall.....	New York.....	N. Y.
21	Steel wire cable.....	Thomson Electric Welding Co.....	Boston.....	Mass.
26	Mitis iron.....	Mitis Wrought-Iron Casting Co.....	Neponset.....	Mass.
Oct. 1	Chain cable.....	Bradlee & Co.....	Philadelphia.....	Pa.
18	Plate iron.....	Boston Bridge Works.....	Boston.....	Mass.
19	Chain iron.....	Bradlee & Co.....	Philadelphia.....	Pa.
21	Steel plates.....	E. D. Leavitt.....	Cambridgeport.....	Mass.
	Cast-iron.....	R. H. Libby.....	Boston.....	Mass.
	Wrought-iron bars.....	Portland Rolling Mill.....	Portland.....	Me.
22	Steel plate.....	New York and New England Railroad.....	Boston.....	Mass.
29	Stone cube.....	Peabody & Stearns.....	do.....	Mass.
31	Brass.....	Aluminum Brass and Bronze Co.....	Bridgeport.....	Conn.
Nov. 1	Building material.....	C. T. Corning & Co.....	St. Paul.....	Minn.
4	Cast-iron.....	John F. Souther.....	Boston.....	Mass.
12	Bronze bars.....	Aluminum Brass and Bronze Co.....	Bridgeport.....	Conn.
	Cast-iron.....	R. H. Libby.....	Boston.....	Mass.
15	Cable chains.....	Thomas Morton.....	New York.....	N. Y.
	Perforated plates.....	Pratt & Whitney Co.....	Hartford.....	Conn.
17	Wrought-iron bolts.....	H. W. Ball.....	Boston.....	Mass.
19	Granite.....	Berlin Granite Co.....	Montpelier.....	Vt.
26	Chain cable.....	Bradlee & Co.....	Philadelphia.....	Pa.
29	Bricks.....	H. W. Ball.....	Boston.....	Mass.
30	do.....	David Smith.....	Newburyport.....	Mass.
Dec. 2	Chain cable.....	P. Hayden Saddlery Hardware Co.....	Columbus.....	Ohio.
4	Bricks.....	C. U. Cotting.....	Boston.....	Mass.
5	Cast-iron.....	J. F. Souther.....	do.....	Mass.
11	Sash chain.....	Thomas Morton.....	New York.....	N. Y.
12	Yellow metal bars.....	George F. Blake Manufacturing Co.....	Boston.....	Mass.
12	Spirally wound tube.....	Pneumatic Dynamite Gun Co.....	New York.....	N. Y.



## PRIVATE TESTS—Continued.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1889.				
Dec. 18	Cast steel.....	I. P. Morris Co.....	Philadelphia.....	Pa.
	Steel plate.....	Stone, Carpenter & Willson	Providence.....	R. I.
19	Cast steel.....	American Steel Car Wheel Co.	Boston.....	Mass.
24	Perforated plates.....	Pratt & Whitney Co.....	Hartford.....	Conn.
1890.				
Jan. 2	Steel bars.....	Standard Steel Co.....	Boston.....	Mass.
6	Chain cable.....	Baker Chain and Wagon Iron Manufacturing Co.	Allegheny.....	Pa.
7	Bricks.....	Norcross Brothers.....	Boston.....	Mass.
	Sandstone.....	do.....	do.....	Mass.
	Marble.....	do.....	do.....	Mass.
16	Bricks.....	do.....	do.....	Mass.
	Bronze.....	Aluminum Brass and Bronze Co.	Bridgeport.....	Conn.
	Plate iron.....	G. W. & F. Smith Iron Co.	Boston.....	Mass.
	Steel and iron castings.....	Golding & Co.....	do.....	Mass.
17	Copper bars.....	C. H. Gay.....	do.....	Mass.
	Bronze.....	Aluminum Brass and Bronze Co.	Bridgeport.....	Conn.
18	Wrought-iron rods.....	Prof. G. Lanza.....	Boston.....	Mass.
20	Rail joints.....	McConway Torley Co.....	New York.....	N. Y.
21	Steel bars.....	American Steel Car Wheel Co.	Boston.....	Mass.
22	Granite.....	Rock Hill Granite Co.....	Bethlehem.....	Pa.
	Swivels.....	Baker Chain and Wagon Iron Manufacturing Co.	Allegheny.....	Pa.
	Wrought-iron rods.....	Prof. G. Lanza.....	Boston.....	Mass.
23	Steel bars.....	Standard Steel Co.....	do.....	Mass.
24	Wrought-iron bar.....	Boston Bridge Works.....	do.....	Mass.
Feb. 1	Marble.....	H. W. Ball.....	do.....	Mass.
3	Bronze.....	Cowles, E. S. & A. I. Co.....	Lockport.....	N. Y.
4	do.....	Aluminum Brass and Bronze Co.	Bridgeport.....	Conn.
	Chain cable.....	Baker Chain and Wagon Iron Manufacturing Co.	Allegheny.....	Pa.
	Iron.....	Mitis Wrought-Iron Casting Co.	Neponset.....	Mass.
	Steel plate.....	C. C. Loring.....	Boston.....	Mass.
	Marble.....	Sheldon Marble Co.....	West Rutland.....	Vt.
5	Bricks.....	Fiske, Coleman & Co.....	Boston.....	Mass.
7	Steel plate.....	Nashua Iron and Steel Co.	do.....	Mass.
12	Paper.....	Philips and Kunhardt.....	Lawrence.....	Mass.
13	Oolitic limestone.....	Franz R. Caden & Co.....	Evansville.....	Ind.
	Stone.....	W. W. Hazlett.....	Walker's Mills.....	Pa.
	Bricks.....	Norcross Brothers.....	Boston.....	Mass.
	Bronze.....	Cowles, E. S. & A. I. Co.....	Lockport.....	N. Y.
15	Zinc buttons.....	A. J. Tower.....	Roxbury.....	Mass.
17	Steel plate.....	New York and New England Railroad.	Norwood.....	Mass.
	Wrought-iron.....	Boston Bridge Works.....	Boston.....	Mass.
19	Copper wire.....	A. A. Brocks.....	do.....	Mass.
	Welded brass and iron pipes.....	Thomson Electric Welding Co.	do.....	Mass.
26	Bricks.....	Frank B. Gilbreth.....	do.....	Mass.
Mar. 3	do.....	Fiske Coleman & Co.....	do.....	Mass.
4	Stones.....	M. A. Sweeney & Bro.....	Jeffersonville.....	Ind.
	Swivel.....	Baker Chain and Wagon Iron Manufacturing Co.	Allegheny.....	Pa.
	Steel hangers.....	Northern Pacific Railroad Co.	St. Paul.....	Minn.
5	Steel plate.....	E. D. Leavitt.....	Cambridgeport.....	Mass.
8	Bricks.....	C. H. Barbour, agt.....	St. Paul.....	Minn.
	Bricks.....	Somerset Potters' Works.....	Somerset.....	Mass.
11	Marble.....	W. K. Sheldon.....	West Rutland.....	Vt.
12	Steel plate.....	Geo. H. Lloyd.....	Boston.....	Mass.
	Steel plate.....	Hartford Steam Boiler Inspection and Insurance Co.	do.....	Mass.
13	Buttons.....	A. J. Tower.....	Roxbury.....	Mass.
	Cement cube.....	H. O. Burch.....	New London.....	Conn.
14	Cast iron.....	G. W. & F. Smith Iron Co.	Boston.....	Mass.
	Bronze.....	Cowles E. S. & A. I. Co.	Lockport.....	N. Y.
19	Chain cable.....	Baker Chain and Wagon Iron Manufacturing Co.	Allegheny.....	Pa.
21	Carbonized stone.....	H. O. Burch.....	New London.....	Conn.
	Face bricks.....	St. Joseph Pressed Brick Co.	St. Joseph.....	Mo.

## PRIVATE TESTS—Continued.

Date.	Material.	For whom tested.			
		Name.	City.	State.	
April	2	Stones .....	Chattanooga Marble and Stone Co.	Chattanooga.....	Tenn.
		Bronze .....	Cowles E. S. & A. I. Co.	Lockport .....	N. Y.
		Wrought iron .....	Boston Bridge Works.....	Boston.....	Mass.
		Steel plate .....	Chas. C. Loring .....	do .....	Mass.
		Cast iron .....	Golding & Co. ....	do .....	Mass.
		Steel hangers.....	Northern Pacific Railroad Co.	St. Paul.....	Minn.
	11	Riveted joint .....	I. P. Morris Co. ....	Philadelphia.....	Pa.
		Steel plate .....	do .....	do .....	Pa.
		Chain cable .....	Baker Chain and Wagon-Iron Manufacturing Co.	Allegheny .....	Pa.
	12	Steel wire .....	Chas. W. Bassett .....	Newton.....	Mass.
16		Copper wire .....	Prof. W. L. Hooper .....	College Hill.....	Mass.
		Granite .....	Yale and Towne Manufacturing Co.	Stamford.....	Conn.
		Marble .....	S. M. Folsom .....	Albuquerque .....	N. Mex.
		Bluestone .....	Warsaw Bluestone Co .....	Warsaw .....	N. Y.
		Steel plate .....	Chas. C. Loring .....	Boston.....	Mass.
	23	Copper wire .....	American Circular Loom Co.	do .....	Mass.
	24	Steel plates .....	Geo. H. Lloyd .....	do .....	Mass.
		Steel castings.....	American Steel Car Wheel Co.	do .....	Mass.
	25	Wire chain .....	Bridgeport Chain Co. ....	Bridgeport .....	Conn.
		Steel rails .....	P. H. Dudley .....	New York .....	N. Y.
28		Chain cable .....	Jas. H. Baker .....	Allegheny .....	Pa.
		Chain iron .....	do .....	do .....	Pa.
	29	Riveted joints .....	I. P. Morris Co. ....	Philadelphia.....	Pa.
		Steel plate .....	do .....	do .....	Pa.
	May 3	Steel plate .....	Chas. C. Loring .....	Boston.....	Mass.
	5	Steel plate .....	Geo. H. Floyd .....	do .....	Mass.
		Copper wire .....	American Circular Loom Co.	do .....	Mass.
		Bricks .....	Boston Terra Cotta Co. ....	do .....	Mass.
		Steel bars .....	Thomson-Houston Electric Co.	Lynn .....	Mass.
		Wrought iron .....	Baker Chain and Wagon-Iron Manufacturing Co.	Allegheny .....	Pa.
13		Granite .....	John H. Rice .....	New York .....	N. Y.
	14	Steel plates .....	Geo. H. Lloyd .....	Boston.....	Mass.
		Steel bar .....	Boston Bridge Works.....	do .....	Mass.
	15	Wrought-iron bars .....	Prof. G. Lanza .....	do .....	Mass.
		Granite .....	Norcross Brothers .....	do .....	Mass.
	20	Wrought-iron bars .....	Thomson Electric Welding Co.	Lynn .....	Mass.
	26	Cast-iron .....	Nashua Iron and Brass Foundry Co.	Nashua.....	N. H.
	27	Chain cable .....	Baker Chain and Wagon-Iron Manufacturing Co.	Allegheny .....	Pa.
	28	Wrought-iron bar .....	P. Hayden Saddlery Hardware Co.	Columbus .....	Ohio.
		Steel-wire rope .....	E. D. Leavitt .....	Cambridgeport .....	Mass.
29		Steel bars .....	Carnegie, Phipps & Co .....	Munhall .....	Pa.
	June 6	Sandstone .....	The Detroit and Hocking Valley Red and Brown Stone Co.	Detroit .....	Mich.
	7	Eye-bar .....	Lehigh Valley Railroad Co.	Mauch Chunk .....	Pa.
	11	Rail joint .....	Standard Railway Rail-joint Co.	Boston.....	Mass.
		Steel plate .....	F. A. Houdlette & Co. ....	do .....	Mass.
	12	Bronze .....	Cowles E. S. and A. I. Co. ....	Lockport .....	N. Y.
	28	Steel plate .....	Chas. C. Loring .....	Boston.....	Mass.
		do .....	Wm. Allen & Sons .....	Worcester.....	Mass.

# INDEX.

---

	Page.
Alternate straining of steel, wrought iron, and cast-iron .....	685
Cast (gun) iron .....	700
Steel bars:	
Marks, SB <sub>1</sub> , L <sub>3</sub> M, N <sub>1</sub> , after annealing .....	687
N <sub>191</sub> R, first specimen, after annealing .....	690
N <sub>191</sub> R, second specimen, before and after annealing .....	692
SB <sub>3</sub> , L <sub>1</sub> M, after annealing .....	695
Wrought iron .....	698
Aluminum, and aluminum brass and bronze .....	667
Aluminum .....	669
Aluminum brass .....	675
Aluminum bronze .....	672
Tabulation .....	678
Axles, railroad. ( <i>See Railroad material.</i> )	
Belleville springs .....	741
Bluestone, North River. ( <i>See Stones and building material.</i> )	
Brake-beam .....	801
Brass, aluminum 3 per cent. ....	675
Bricks. ( <i>See Stones and building material.</i> )	
Bronze:	
Aluminum, 10 per cent .....	672
Fractured tray hinge .....	679
Building block. ( <i>See Stones and building material.</i> )	
Cast-iron:	
Pig-irons .....	739
Watertown Arsenal .....	737
With aluminum flux .....	738
Watervliet Arsenal .....	739
Chain cable .....	862
Cordage:	
Manilla rope .....	1151
Shot lines, linen .....	1135
No. 4 line .....	1137
No. 7 line .....	1141, 1144
Elongation under stress .....	1143
Different parts of coil .....	1142
Waterproofed .....	1143
No. 9 line .....	1146
Cotton cloth .....	1150
Endurance of rotating shafts .....	863
Description .....	865
Cast (gun) iron; No. 4 .....	1048

	Page.
<b>Endurance of rotating shafts—Continued.</b>	
O. H. steel bars:	
No. 1 .....	866, 874, 876, 878, 882, 884
No. 2 .....	891, 893, 896, 900, 906
No. 3 .....	911, 914, 920, 925, 931
No. 4 .....	936, 938, 939, 940
No. 5 .....	941, 943, 945, 946
No. 6 .....	947, 949, 950
No. 7 .....	951, 953
No. 15 .....	953
No. 21 .....	956
Wrought-iron bars:	
No. 1 .....	958, 964, 967, 974
No. 2 .....	980, 982, 984, 988, 989
No. 3 .....	990, 997, 999, 1000, 1002
No. 4 .....	1004, 1006, 1012, 1018, 1023
No. 5 .....	1028, 1029, 1030, 1032, 1034
No. 6 .....	1035, 1036, 1037, 1039, 1040
No. 6a .....	1041
No. 7 .....	1042
No. 8 .....	1042
No. 9 .....	1044, 1046, 1047
Summarized tabulation .....	1050
Tension tests of ruptured endurance shafts:	
O. H. steel .....	1057
Wrought iron .....	1072
Tabulation .....	1095
Expansion, coefficient of, stones and bricks .....	1099, 1108
Eyebar (steel), specimens from overstrained stom .....	719
Tabulation .....	731
Granite. ( <i>See</i> Stones and building material.)	
Gun specimens:	
3.2-inch steel B. L. rifles .....	13
Gas check .....	42
No. 12 .....	45
No. 51 .....	46
No. 70 .....	48
Jackets, specific gravity and hardness .....	49
Tube No. 54 .....	15
No. 55 .....	16
No. 56 .....	17
No. 57 .....	24
No. 60 .....	26
No. 64 .....	28
No. 66 .....	32
No. 68 .....	34
No. 69 .....	35
No. 70 .....	36
No. 71 .....	40
No. 73 .....	41
Specific gravity and hardness .....	49
Tabulation .....	49
3.6-inch steel B. L. rifle No. 1. Key-ring .....	50
8-inch steel B. L. Rifles .....	51
Jacket No. 3 .....	54

	Page.
Gun specimens—Continued.	
8-inch steel B. L. Rifles—Continued.	
Jacket No. 4 .....	56
No. 6 .....	57
Specific gravity and hardness .....	59
Tube No. 3 .....	53
No. 4 .....	55
10-inch wire-wound rifle. Woodbridge .....	
Straining of cold rolled staves .....	858
10-inch wire-wound rifle .....	61
Hoop C <sub>3</sub> .....	94
C <sub>4</sub> .....	96
C <sub>5</sub> .....	99
C <sub>6</sub> .....	102
Jacket .....	82
Ring A .....	91
Tube .....	63
Tabulation .....	105
12-inch steel B. L. rifle No. 1 .....	107
Breech bushing .....	166
Gas check .....	164
Hoop A <sub>1</sub> .....	147
A <sub>3</sub> .....	149
A <sub>5</sub> .....	150
A <sub>6</sub> .....	151
B <sub>2</sub> .....	152
B <sub>5</sub> .....	153
B <sub>8</sub> .....	154
C <sub>3</sub> .....	155
C <sub>4</sub> .....	156
C <sub>6</sub> .....	157
C <sub>8</sub> .....	158
C <sub>9</sub> .....	159
D <sub>2</sub> .....	161
D <sub>4</sub> .....	162
Specific gravity and hardness .....	163
Jacket .....	130
Trunnion hoop .....	163
Tube .....	109
Tabulation .....	167
12-inch B. L. rifled mortars .....	171
Mortar No. 1:	
Body (condemned) .....	173
Trunnion hoop .....	367
Mortar No. 2:	
Body .....	181
Gas check .....	375
Hoop A <sub>7</sub> .....	369
B <sub>3</sub> .....	372
B <sub>8</sub> .....	374
Trunnion hoop .....	368
Mortar No. 3:	
Body .....	187
Hoop A <sub>4</sub> .....	378
A <sub>5</sub> .....	379

	Page.
Gun specimens—Continued.	
12-inch B. L. rifled mortars—Continued.	
Mortar No. 3—Continued.	
Hoop B <sub>1</sub> .....	380
B <sub>3</sub> .....	381
Trunnion hoop .....	377
Mortar No. 4	
Body .....	193
Gas check .....	387
Hoop A <sub>3</sub> .....	382
A <sub>4</sub> .....	383
B <sub>4</sub> .....	384
B <sub>5</sub> .....	385
Trunnion hoop .....	386
Mortar No. 5:	
Body .....	199
Hoop A <sub>4</sub> .....	389
A <sub>5</sub> .....	390
B <sub>5</sub> .....	391
Trunnion hoop .....	392
Mortar No. 6:	
Body .....	205
Gas check .....	395
Hoop A <sub>4</sub> .....	393
B <sub>4</sub> .....	394
Mortar No. 7:	
Body .....	210
Hoop A <sub>5</sub> .....	397
B <sub>3</sub> .....	398
Mortar No. 8:	
Body .....	213
Hoop B <sub>1</sub> .....	399
B <sub>5</sub> .....	400
Mortar No. 9:	
Body .....	216
Hoop A <sub>4</sub> .....	403
A <sub>5</sub> .....	404
B <sub>1</sub> .....	405
Mortar No. 10:	
Body .....	220
Hoop A <sub>3</sub> .....	406
A <sub>5</sub> .....	407
B <sub>1</sub> .....	408
Mortar No. 11:	
Body .....	224
Hoop A <sub>4</sub> .....	409
B <sub>5</sub> .....	410
Mortar No. 12:	
Body .....	232
Quadrants from disks, compression of .....	755
Hoop A <sub>4</sub> .....	411
B <sub>1</sub> .....	412
Mortar No. 13:	
Body .....	240
Hoop A <sub>3</sub> .....	413
B <sub>1</sub> .....	414

## Gun specimens—Continued.

Page

## 12-inch B. L. rifled mortars—Continued.

Mortar No. 14:	
Body .....	247
Hoop A <sub>4</sub> .....	415
B <sub>6</sub> .....	416
Mortar No. 15:	
Hoop A <sub>3</sub> .....	417
B <sub>1</sub> .....	418
Mortar No. 16:	
Body .....	254
Hoop A <sub>4</sub> .....	419
B <sub>1</sub> .....	420
Mortar No. 17:	
Body .....	261
Hoop A <sub>4</sub> .....	421
B <sub>1</sub> .....	422
Mortar No. 18:	
Body .....	268
Hoop B <sub>1</sub> .....	423
Mortar bodies:	
No. 19 .....	275
No. 20 .....	282
No. 21 .....	288
No. 22 .....	294
No. 23 .....	300
No. 24 .....	306
Quadrants from disks, compression of .....	755
No. 25 .....	312
No. 26 .....	319
No. 27 .....	325
No. 28 .....	331
No. 29 .....	337
No. 30 .....	343
No. 31 .....	349
Specific gravity and hardness:	
Bodies .....	424
Hoops .....	425
Tabulation:	
Bodies .....	355
Hoops and gas checks .....	426
Initial strains in 8-inch tube and jacket, and hoop A, for 12-inch steel B. L. rifle.	733
8-inch steel B. L. rifle:	
Jacket .....	735
Tube .....	736
12-inch steel B. L. rifle:	
Hoop A .....	736
Limestone. (See Stones and building material.)	
Marble. (See Stones and building material.)	
Pig-irons .....	739
Private tests .....	1152
Pyrotechnic mortar body .....	861
Quadrants from disks of 12-inch mortar bodies .....	753
Railroad material:	
Axles, muck-bar tender .....	757
Description .....	759

	Page.
Railroad material—Continued.	
Axles, muck-bar tender—Continued.	
No. 7.....	760
No. 8.....	769
No. 9.....	778
Tabulation.....	787
Brake beam.....	801
Steel rails.....	789
Hardness.....	800
Transverse tests.....	792
Rope, manila.....	1151
Rubber buffers.....	748
Sandstone. ( <i>See</i> Stones and building material.)	
Shot lines for U. S. Life-Saving Service. ( <i>See</i> Cordage.)	
Slate. ( <i>See</i> Stones and building material.)	
Springs, Belleville.....	741
Staves for Woodbridge 10-inch rifle.....	858
Steel bars:	
Fixtures for hydrostatic test of 8-inch tube.....	839
For comparison of testing machines.....	811, 815, 833
Tabulation.....	831
From L. Gathman.....	849
From National Armory.....	857
From Ordnance Office.....	807
5-inch siege-carriage metal.....	802
Steel plate, 7-inch siege-carriage metal.....	806
Steel rails. ( <i>See</i> Railroad material.)	
Stones and building material.....	1097
Coefficients of expansion:	
Bluestone, North River.....	1103
Bricks:	
Ashler.....	1107
Fire.....	1106, 1107
Red.....	1105, 1106
Building block, hollow, fireproof.....	1107
Granite:	
Cape Ann.....	1105
Quincy.....	1104
Worcester.....	1104
Limestone:	
Indiana.....	1100
Indiana, hoosier buff Oolitic.....	1099
Marble:	
Lee, Mass.....	1101
Vermont.....	1100
Sandstone:	
Ohio.....	1102
Portland red.....	1102
Potomac red.....	1101
Slate, Monson, Maine.....	1103
Tabulation.....	1108
Compression tests and moduli of elasticity:	
Bluestone, North River.....	1123
Granite:	
Cape Ann.....	1130
Quincy.....	1128
Worcester.....	1126



	Page.
<b>Stones and building material—Continued.</b>	
<b>Compression tests and moduli of elasticity—Continued.</b>	
<b>Limestone:</b>	
Indiana .....	1110
Indiana, hoosier buff Oolitic .....	1109
<b>Marble:</b>	
Lee, Mass .....	1113
Vermont .....	1111
<b>Sandstone:</b>	
Ohio .....	1120
Portland red .....	1119
Potomac red .....	1116
Slate, Monson, Maine .....	1122
Tabulation .....	1134
<b>Transverse tests:</b>	
Bluestone, North River .....	1125
<b>Granite:</b>	
Cape Ann .....	1133
Quincy .....	1129
Worcester .....	1127
<b>Marble:</b>	
Lee, Mass .....	1115
Vermont .....	1112
Sandstone, Potomac red .....	1118
Tabulation .....	1134
Tape, brass and steel ribbon .....	681
Wire, steel, round, square, and flat .....	429
0.10 inch square—	
Round rods before drawing .....	431
After second drawing .....	441
After third drawing, first hole .....	447
After third drawing, second hole .....	457
<b>Finished wire—</b>	
Not tinned .....	457, 589, 600, 652
Tinned .....	467, 583, 647, 655
Tabulation .....	578, 598, 635, 650, 664
Electrically annealed .....	665
Electrically welded .....	599, 638, 650
0.15 inch square—	
Not tinned .....	612
Tinned .....	595, 628, 644
Tabulation .....	589, 635, 650
Electrically annealed .....	665
Electrically welded .....	599, 650, 665
<b>Flat—</b>	
Not tinned .....	592, 606, 615, 658
Tinned .....	586, 618, 640, 661
Tabulation .....	598, 635, 650, 664
Electrically welded .....	639, 650
Wrought iron:	
5-inch siege-carriage metal .....	805
Pyrotechnic mortar body .....	861











JOHN H. BARR.





JOHN H. BARR

